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DEVELOPMENT OF TIRES

FOR

THE FAMILY OF MEDIUM TACTICAL TRUCKS

United States Rubber Tire Company
Detroit 32, Michigan

R. A. Reichert/E. D. Rogers-ATAC

FINAL REPORT

PHASE I AND II

FEBRUARY 1965

DETROIT PROCUREMENT DISTRICT U. S. ARMY

CONTRACT NO. DA 20-018-AMC 0585T

Technical Supervision by Research and Engineering Directorate

Army Tank Automotive Center

Detroit Arsenal, Center Line, Michigan

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ABSTRACT
Technical Report

January 27, 1965

FINAL REPORT ON DEVELOPMENT OF TIRES FOR THE NEW FAMILY OF MEDIUM TACTICAL TRUCKS

R. A. Reichert
United States Rubber Tire Company

The overall objectives of this contract were -

1. To supply thirty (30) 11.00-20 size radial ply tires, 6 ply nylon carcass with 2 ply wire belted treads, designed to provide increased performance over tires previously produced on Contract No. DA 20-018-ORD-20440.

2. Conduct a radial ply tire design investigation into the larger tire size (16-20) with low profile construction.

3. Perform a feasibility study of the replaceable tread tire concept.

Work was directed toward -

1. Increasing resistance to breaker separation, liner splitting and circumferential splice opening.

2. Increasing durability and improving general off-the-road performance of the tires.

Field testing of the 11.00-20 tires, under the direction of the Army Tank Automotive Center showed that the tires were much improved over previous radial tires tested. However, a few tires still failed from sidewall cracking.

The contract was revised to emphasize improvement in sidewall cracking resistance. This was accomplished by changing from a synthetic stock compound in the sidewall to a natural rubber compound with a neoprene veneer. Indoor sidewall cracking test results of tires with the natural rubber/neoprene veneer sidewalls indicate a vast improvement in cracking resistance over tires with previous sidewall construction.

Excellent test results were obtained with 16-20 low profile tire on all types of indoor tests. Due to the performance level of these tires on indoor testing, we feel that this tire is more than adequate for field endurance tests.

The experimental test results of the replaceable tread tire were very favorable and we feel that this concept should be broadened to include the highway-type tire.

ACKNOWLEDGMENT

The author wishes to acknowledge assistance received in this endeavor from Messrs. J. M. Almand, L. R. Gill, W. G. Hill, W. K. Klamp, W. C. Macklem, J. G. Manchetti and M. Ramos of the United States Rubber Tire Company.

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1. CONTRACT OBJECTIVES

1.1 Phase I

To supply thirty (30) nylon radial carcass, belted tread design 11.00-20 tires designed to provide increased performance over tires previously supplied on Contract DA 20-018-ORD-20440. The breaker and carcass ply stocks are of a natural rubber composition and the tread of synthetic rubber.

1.2 Phase II

Conduct a radial ply tire design investigation into the larger tire size (16-20) with low profile construction and to perform a feasibility study of the replaceable tread tire concept in the 11.00-20 size tire.

2. SUMMARY

2.1 Phase I - 11.00-20 Integral Tires

Field test results of the 11.00-20 integral tires indicated an improvement in performance over tires previously tested. However, with the increased mileage a sidewall cracking deficiency was noted. We believe that we have a method of correcting this problem as evidenced by the indoor sidewall cracking test results on the 16-20 size tires.

All experimental tires tested prior to shipment passed endurance test requirements.

2.2 Phase II - 16-20 Low Profile Tires

With the information obtained from the test results on Phase I tires, we were prompted to revise the construction features of the 16-20 low profile and 11.00-20 replaceable tread tires.

We proposed and received a contract modification to change from synthetic tread and sidewall stock to a natural rubber compound with a neoprene veneer on the sidewall. This revised construction showed a vast improvement on indoor sidewall cracking test over results obtained with the previous construction.

The initial fourteen (14) 16-20 field evaluation tires were fluoroscoped and some irregular spacing of the cords in the breakers at the splice was found. The quality of these tires was questionable for penetration resistance and tread wear.

It was necessary to rebuild the fourteen (14) field evaluation tires in order to obtain tires with the desired quality level, as determined by visual and fluoroscopic examination, for field testing at Camp Bullis.

To establish the performance level of the tires with irregular spacing in the breaker cords, an agreement was reached with Messrs. Heinrich,

2. SUMMARY (cont'd)

2.2 Phase II - 16-20 Low Profile Tire (cont'd)

Jackson, and Rogers at the Detroit Arsenal to field test seven (7) of the first group of tires.

The 16-20 low profile tactical tire performed exceptionally well on all types of indoor testing. Based on these test results, we feel that this tire is more than adequate to meet the requirements for application to the new family of medium tactical trucks.

2.3 Phase II - 11.00-20 Replaceable Tread Tires

The indoor test results on this tire were very favorable. Although the testing of this tire was limited, there was no displacement of the tread band on the carcass during the test.

2.4 Testing

2.4.1 Indoor Tests

To establish the laboratory performance level of the experimental tires, the following test programs were conducted:

Phase I

Two tests were used - the stepped down inflation test and the 30 mph smooth wheel endurance test.

Phase II - 16-20/10 P.R. Tire

Four tests were used, the 30 mph smooth wheel endurance test, bead adequacy test, sidewall cracking test, and the average breaking energy plunger rupture test.

In addition to the above tests the 16-20/10 P.R. tire was subjected to a hydroburst test to establish the burst strength of the tire.

Phase II - 11.00-20 Replaceable Tread Tire

Testing of this tire was limited to the 30 mph smooth wheel endurance test.

2.4.2 Indoor Endurance Test

The 30 mph smooth wheel stepped up load endurance test was used to evaluate the separation resistance of the 11.00-20 and the 16-20 radial ply tires.

2. SUMMARY (cont'd)

2.4 Testing (cont'd)

2.4.2 Indoor Endurance Test (cont'd)

Loads and inflations for this test were as follows:

	11.00-20	16-20
Test Inflation	50 psi	50 psi
Initial Load	3850#	4125#
Load increment increase at 65 hours and every 24 hours thereafter	350#	375#

The results of the tests which are listed in Table I indicate a vast improvement in the 16-20 low profile tire for breaker and ply separation resistance as compared to 11.00-20 integral tire.

Table I

	Total Hours	Failure	Load at Failure
11.00-20 Integral Tire Radial Ply	201.0	Fabric Fatigue	5450#
16-20 Radial Ply Tire	280.9	Removed complete	7500#
	263.7	" "	7500#
11.00-20 Replaceable Tread Tire Radial Ply	136.3	Removed complete	4900#
	106.3	" "	4550#

2.4.3 Sidewall Cracking Tests

The sidewall cracking test for the 16-20 low profile tire was conducted on a smooth wheel. The tire was run at slow speed (25 mph), low inflation (20 psi) and loaded to 3750# (rated tire load).

Two groups of tires were evaluated for sidewall cracking. Group I tires featured a natural rubber sidewall and Group II tires a natural rubber sidewall with a neoprene veneer. The results listed in the following Table II indicate a definite improvement in sidewall cracking resistance with the natural rubber/neoprene veneer combination.

2. SUMMARY (cont'd)

2.4 Testing (cont'd)

2.4.3 Sidewall Cracking Tests (cont'd)

Table II

Group I	Total Hours	Failure
16-20 Radial Tire	(*) 220.0	Sidewall cracking
	(*) 220.0	" "
Group II		
16-20 Radial Tire	272.00	Removed - complete
	272.0	" "

(*) Sidewall cracking was initiated at 110.0 hours. The tires were kept running to study rate of crack growth.

2.4.4 Bead Adequacy Test

To establish the performance level of the 16-20 low profile tires for bead adequacy, two tires were tested on a flat belt machine. The tires were inflated to 35 psi and mounted diametrically opposite on a vertical flat belt. The tires were then over-loaded to 6675# and run at speed of 23 mph. These conditions were designed to produce a flex strain in the bead area of the tire without generating excessive heat in tread.

Results listed in Table III indicate that the performance level of the beads is more than adequate since 200 hours on this test is considered very good.

Table III

	Total Hours	Failure
16-20 Radial Tire	264.7	Removed - complete
	264.7	Slight sidecover separation

2.4.5 Stepped Down Inflation Test

Test conditions for this test are as follows: load 3500#; speed 30 mph; inflation 50, 40, 30, 20, and 10 psi for 24 hours each on a smooth wheel.

One 11.00-20 integral tire was subjected to this test and failed from fabric fatigue one hour after entering the 10 psi phase.

2. SUMMARY (cont'd)

2.4 Testing (cont'd)

2.4.6 Hydroburst Test

A 16-20 tire was subjected to a hydrostatic burst test. The tire failed with a broken bead bundle at 415 psi. The actual burst value agrees with the calculated burst value for this tire.

2.4.7 Plunger Test

Plunger tests were conducted on the 16-20 low profile tire at 35 psi. The average breaking energy was 46,181.28 in.lbs. which is more than ample for rupture resistance for the tire.

3. DISCUSSION

3.1 Tire Design

3.1.1 11.00-20 Integral Tire

In order to meet the objective for Phase I a revised construction of the 11.00-20 radial ply, wire belted tire, as compared to that featured in previous Contract DA 20-018-ORD-20440, was designed. The revised construction featured 6 full plies of 1680/2 denier nylon cord and 2 low angle breakers of 5x7x.0059 flexible steel cable. The sidewall featured a layer of wire loaded stock with a cover of synthetic stock. Chlorobutyl (a stock which is highly resistant to liner cracking) was featured as the liner stock in this construction.

To increase the resistance of tire to rim chafing an SBR-CisBR stock with excellent elongation and flex cracking properties was used as a rim flange strip. An SBR-CisBR/NR cement was used at all tread and sidewall junctions to increase splice opening resistance of the tire.

The six nylon plies provided the required carcass strength and the two wire breakers provided the needed circumferential strength of the tire.

Load deflection curves, Figures 17 and 20, are shown on pages 27 and 30 and engineering data are shown in Table VI.

3.1.2 16-20 Low Profile Tires

From the knowledge gained with the Phase I tires tested at Camp Bullis, the 16-20 radial ply tire was designed to provide a tire with increased sidewall cracking resistance.

The construction of this tire featured 6 full plies of 1680/2 denier nylon cord and 2 low angle breakers of 5x7x.0059 flexible

3. DISCUSSION (cont'd)

3.1 Tire Design (cont'd)

3.1.2 16-20 Low Profile Tires (cont'd)

steel cable. The sidewall featured a layer of wire loaded stock covered by a natural rubber sidewall with a neoprene veneer. Six nylon plies and two wire breakers provided the required structural strength of the tire. A chlorobutyl liner was featured in this construction also. The neoprene veneer reduces checking and sidewall cracking (see see Sidewall Cracking Test Results).

Since the 16-20 size tire was entirely new, experimental tires were required to verify constructions.

Load deflection curves, Figures 18 and 21, are shown on pages 28 and 31 and engineering data are shown in Table VI.

3.1.3 11.00-20 Replaceable Tread Tire

The carcass construction features of the 11.00-20 replaceable tread tire were identical to those of the 16-20 size tire. The tread band featured two circumferentially wound breakers of flexible steel cable to provide maximum restraint of movement of the breaker band on the carcass.

Experimental tires were required to verify the construction.

The initial construction check tire revealed a slight misfit of the tread band and carcass. The carcass rings were modified to provide a more uniform fit or mating of the carcass and tread band.

Load deflection curves, Figures 19 and 22, are shown on pages 29 and 32 and engineering data are shown in Table VI.

3.2 Mold Design

3.2.1 16-20 Low Profile Tire

The tire mold was designed to the low profile principle using a section height to section width ratio of .74. The mold has a 43.950 inch outside diameter, a 15.30 inch cross section and a 15.30 inch crown radius. The tread pattern was similar to the tread designed for the 11.00-20 integral tire, a tactical design with the tread pattern ending at the tread shoulder.

Prints of the mold and letter drawings are included with this report.

3. DISCUSSION (cont'd)

3.2 Mold Design (cont'd)

3.2.2 11.00-20 Replaceable Tread Tire

The 11.00-20 replaceable tread tire mold was designed to produce a carcass and tread band which when assembled would yield a tire of the same dimensions as the 11.00-20 integral tire with an overall diameter of 42.540 inches and a 11.600 inch cross section.

3.3 Rim Design

The rim for the 16-20 size tire was designed for tubed type tires. The rim has a semi-drop center, 12" width, 20" nominal diameter with heel diameter .188" over nominal, 5° tapered bead seat and a modified safety hump to prevent slippage or bead displacement under emergency conditions.

3.4 Fabrication of Tires

3.4.1 Phase I - 11.00-20 Integral Tires

Existing equipment was utilized in the production of the thirty (30) 11.00-20 integral tires for this phase of the contract. No manufacturing difficulties were encountered.

3.4.2 Phase II - 16-20 Low Profile Tires

The only special equipment required to produce the 16-20 size tire was a tire mold. Curing bags and toe rings available from a previous government contract were used in the manufacturing of these tires.

Building procedures, shaping bagging and curing of the 16-20 low profile tires were similar to those for radial ply tires previously produced for highway service.

3.4.3 Phase II - 11.00-20 Replaceable Tread Tires

Equipment needed to manufacture the 11.00-20 replaceable tread tires comprised a tire mold, carcass rings, drum building core, segmented tread rim and one bottom toe ring.

The breakers for this tire were circumferentially wound. No preshaping of the carcass was necessary prior to cure.

A slight recut of the carcass rings was necessary to provide a tighter fit of the carcass to the tread band (see mold profile attached to this report which shows recut).

3 DISCUSSION (cont'd)

3.5 Tubes

16-20 size tubes were supplied in compliance with applicable requirements of Government Specification ZZI-550. Tube weight was 15 lbs.

Although flaps were supplied, the design of the 16-20 tire beads and the rim seat permitted tubed tire operation without the use of flaps.

3.6 Tire Mounting

In Phase II mounting checks were made on the 16-20 tire on the rim designed for this vehicle by Ford Motor Company. Mounting and dismounting were satisfactory.

As a safety precaution 40 psi should not be exceeded during tire mounting.

3.7 Measurements

The measurements taken in conjunction with the test program were load deflection curves, vertical spring rates, tread pressures, footprints, weight, cross section, outside diameter, loaded radius, rolling radius and gross and net contact areas.

Table IV lists all measurements taken on the specified tires. The pages which follow contain Figures 8 through 22 which are the load deflection curves, footprints, tread pressures and closed loop load deflection or spring rate curves.

Table IV

Measurement	11.00-20 Integral	16-20	11.00-20 Rep.Trd.
Cross Section	13.79	16.92	13.84
Outer Diameter	42.50	43.85	42.59
Loaded Radius	19.25	20.19	19.39
Tread Width	8.09	10.41	8.39
Deflection at 3750# load and 35 psi inflation	2.004	1.788	1.902

3. DISCUSSION (cont'd)

3.7 Measurements (cont'd)

Table V

Measurement	11.00-20 Integral	16-20	11.00-20 Rep.Trd.
Vertical Spring Rate at 3750# load and 35 psi inflation	2315#/in.	2604#/in.	2399#/in.
Weight	201# 2 oz.(1)	241# 10 oz.(1)	210# 2 oz.(1)
Rim	8.00	12.00	8.00

(1) Includes weight of tire, rim, tube and flap.

Table VI

Engineering data of the 11.00-20 integral 16-20 low profile, and the 11.00-20 replaceable tread tires.

	11.00-20 Integral	16-20	11.00-20 Rep.Trd.
Load (lbs.)	3500	3750	3500
Inflation (psi)	30	35	30
Rim Dimensions (Diameter and Width)	20x8.0	20x12.0	20x8.0
Max. Cross Section (in.)	12.17	15.84	12.27
Overall Diameter (in.)	42.50	43.85	42.59
Mold Antiskid (in.)	.65	.67	.65
Loaded Radius (in.)	19.25	20.19	19.39

3.8 Weight Data

Tire and rim assembly weights were as follows:

	11.00-20 Integral	16-20	11.00-20 Rep.Trd.
Tire	117#	158#	119#
Tube	10# 10 oz.	14# 6 oz.	10# 10 oz.
Flap	6# 0 oz.	8# 4 oz.	6# 0 oz.
Rim	73# 8 oz.	61# 0 oz.	73# 8 oz.

4. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions can be based on laboratory measurements, indoor testing and field testing information gained on this contract.

4.1 Phase I

1. The 11.00-20 integral tires performed better on indoor tests than tires previously supplied for field testing.

2. A definite improvement was realized in the 11.00-20 integral tires for circumferential splice opening and liner cracking resistance.

3. An advantage for tread wear traction and puncture resistance for the radial ply tires was indicated by the performance of the tires tested at Camp Bullis.

4. The 11.00-20 integral radial ply wire-belted tire showed a sidewall cracking deficiency during field testing; however, we believe this problem has been corrected.

4.2 Phase II

1. Indoor test results indicate that the 16-20 profile tire is more than adequate to meet the demands of the tire.

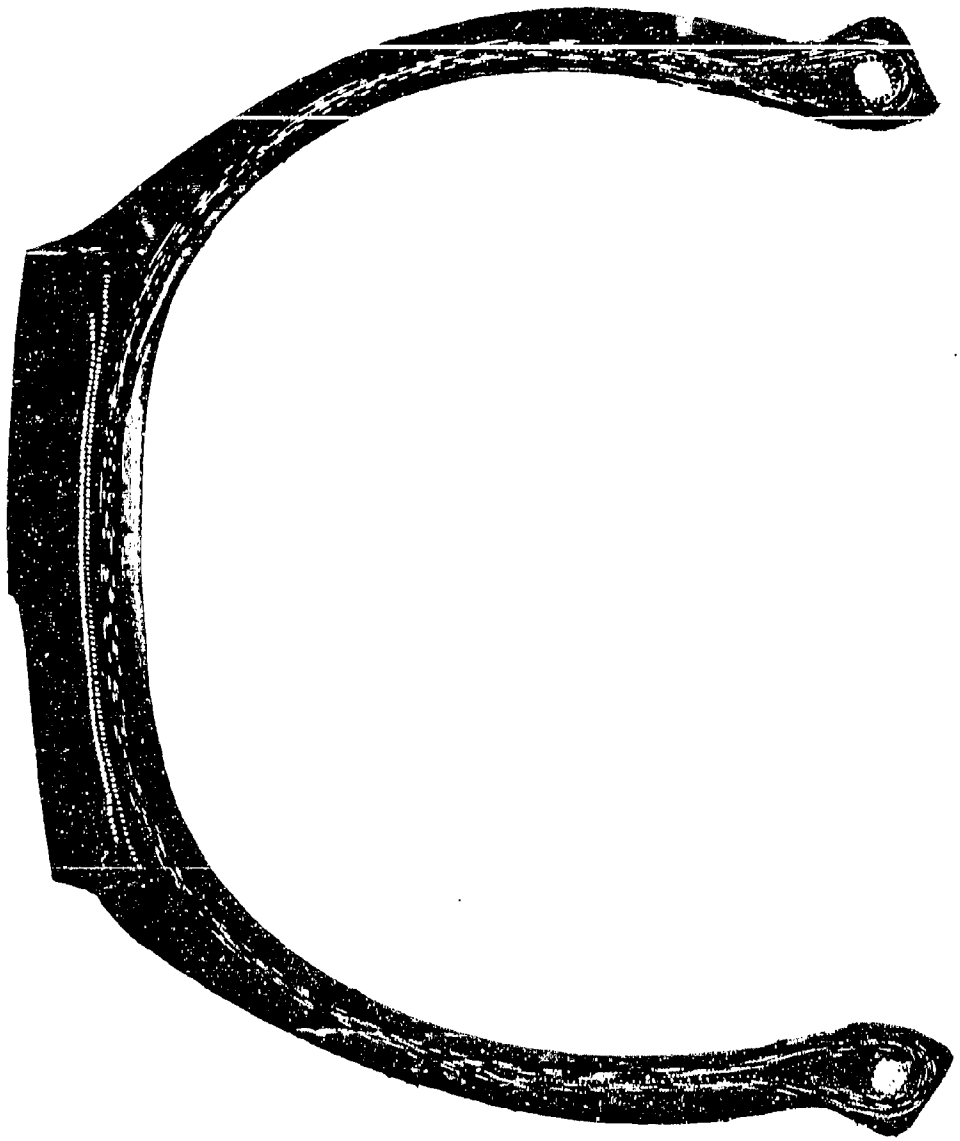
2. Based on the closed loop deflection curves, the radial ply tactical tires have a low hysteresis loss.

3. The radial ply wire-belted tires afford a more uniformly distributed load in the deflected area.

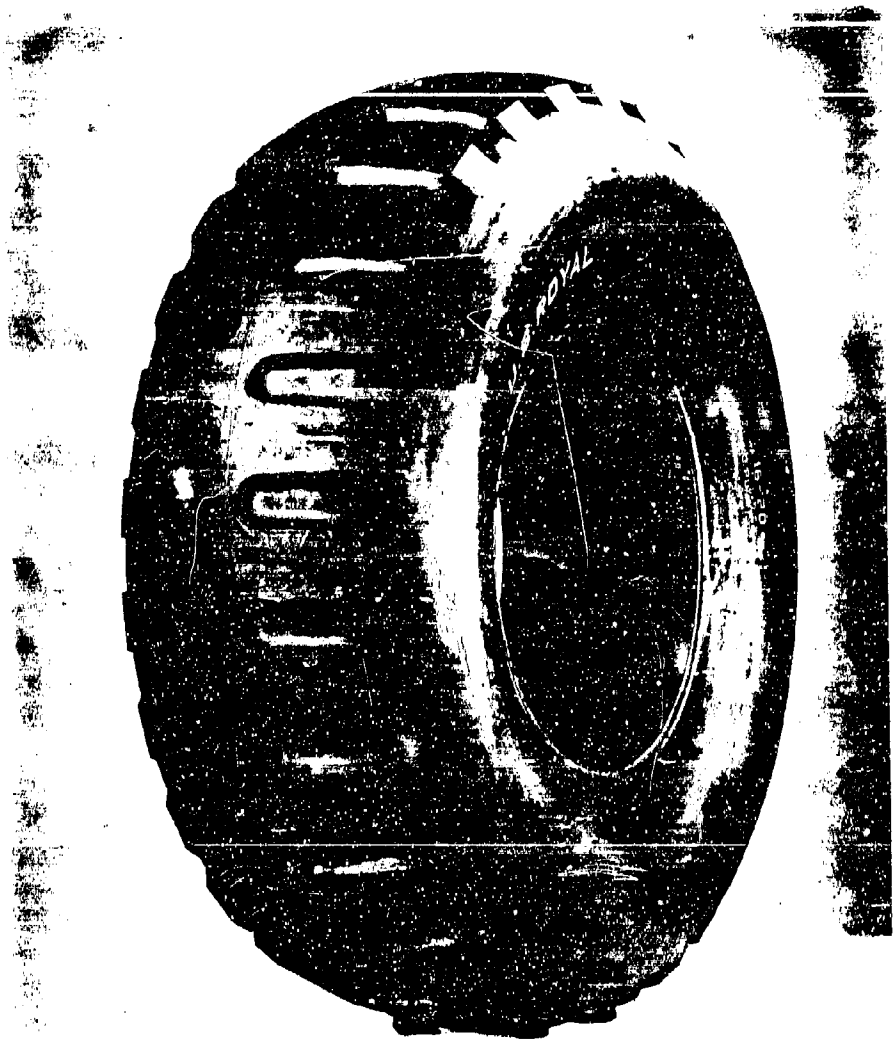
4. Indoor test results were very favorable for the replaceable tread tire.

5. It is recommended that the feasibility study of the replaceable tread concept be expanded to include the highway type tire.

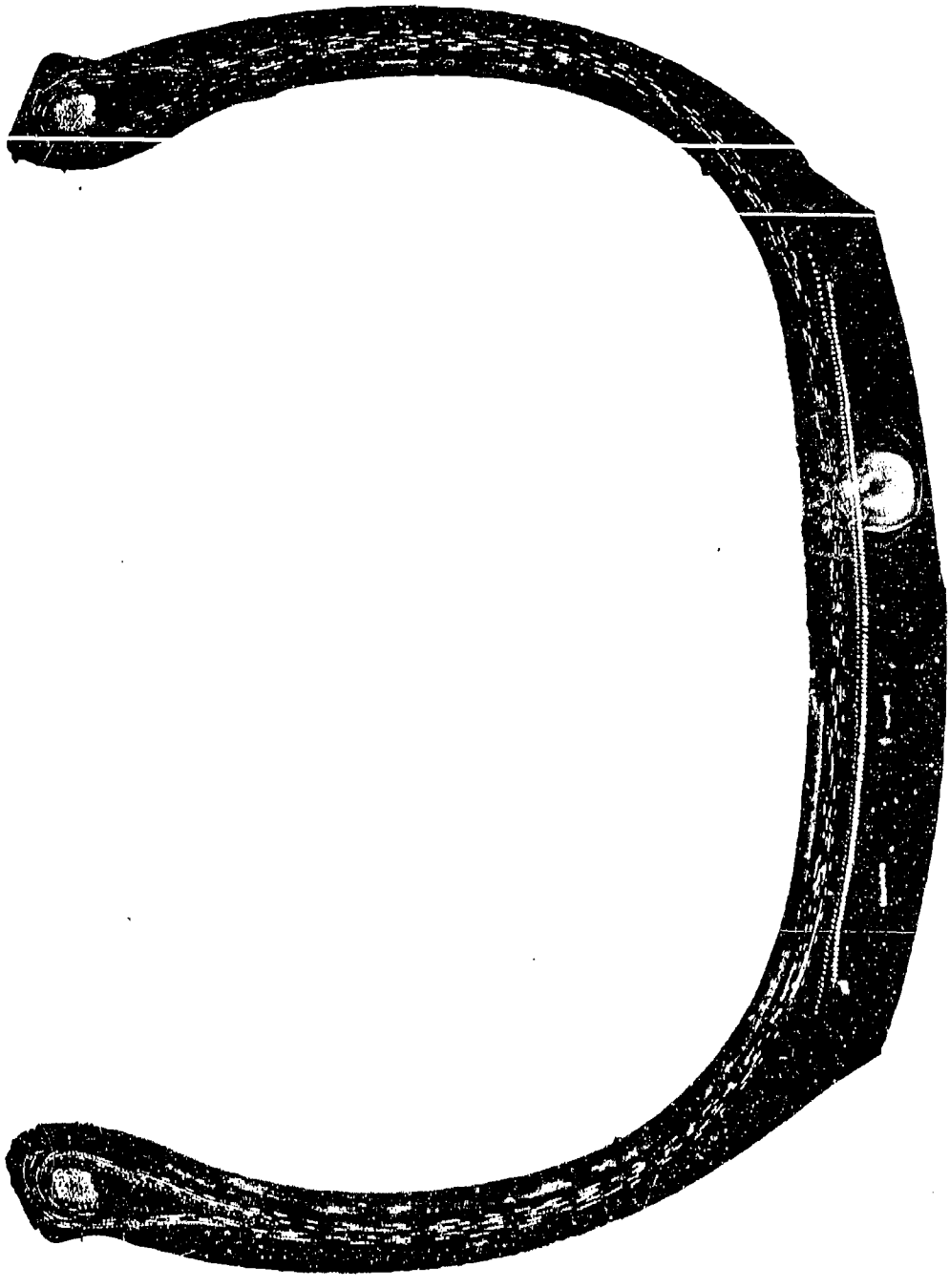
6. It should be noted that the sidewall cracking resistance of the 16-20 low profile radial ply tire was greatly improved with a natural rubber neoprene veneer sidewall construction. We believe this type sidewall construction would have increased the sidewall cracking resistance of the 11.00-20 integral tires tested at Camp Bullis.



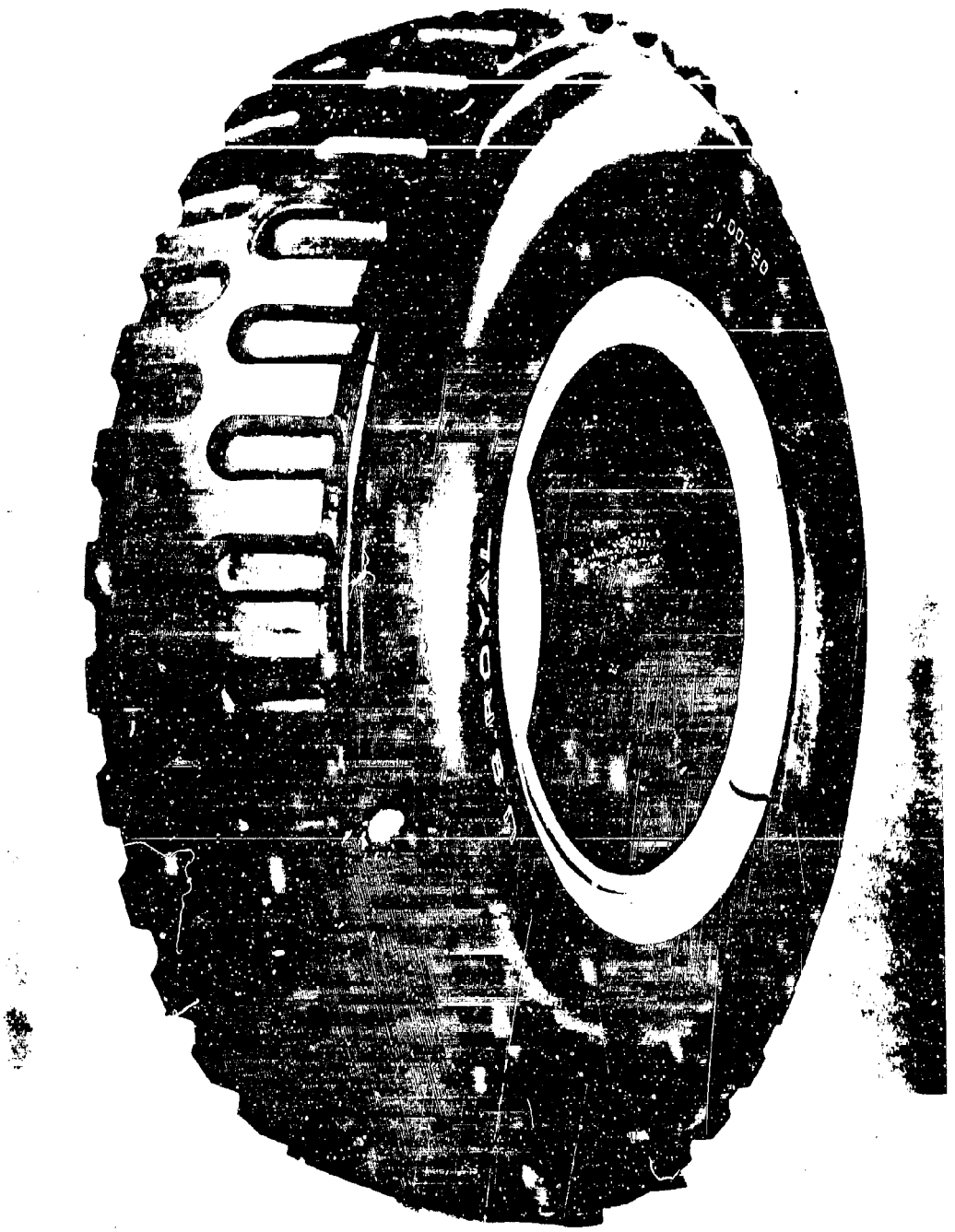
11.00–20
INTEGRAL TIRE SECTION
FIGURE 1



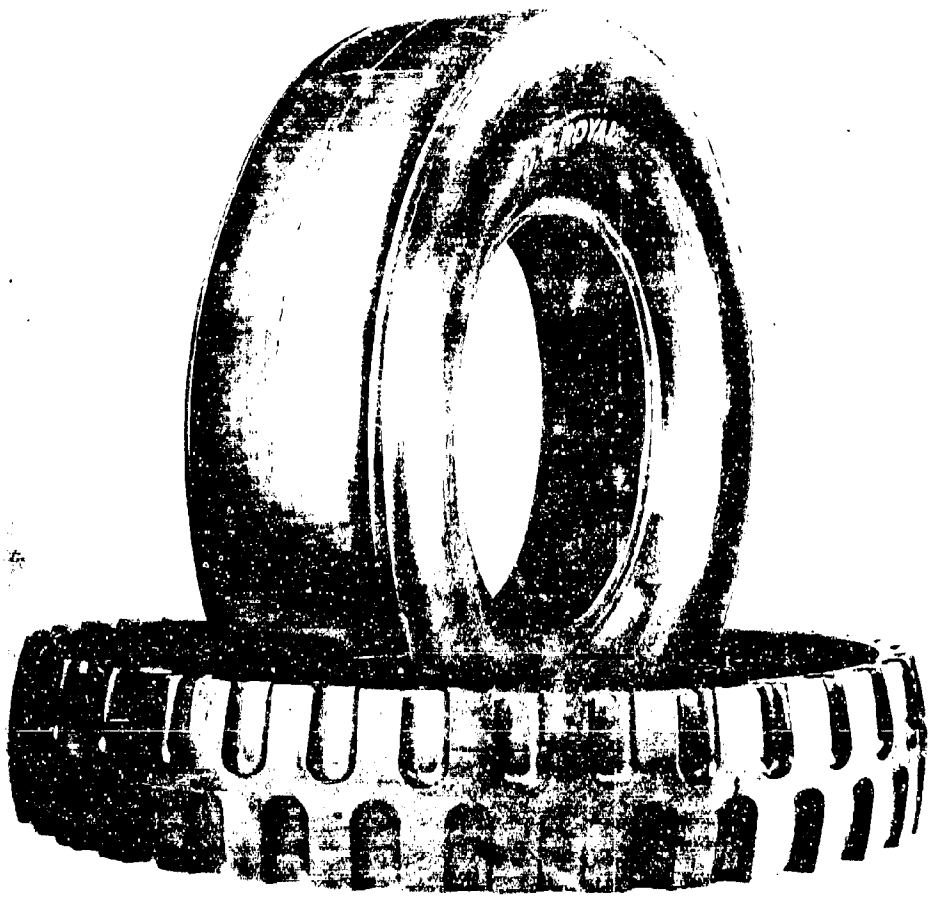
16—20
LOW PROFILE RADIAL PLY TIRE
FIGURE 2



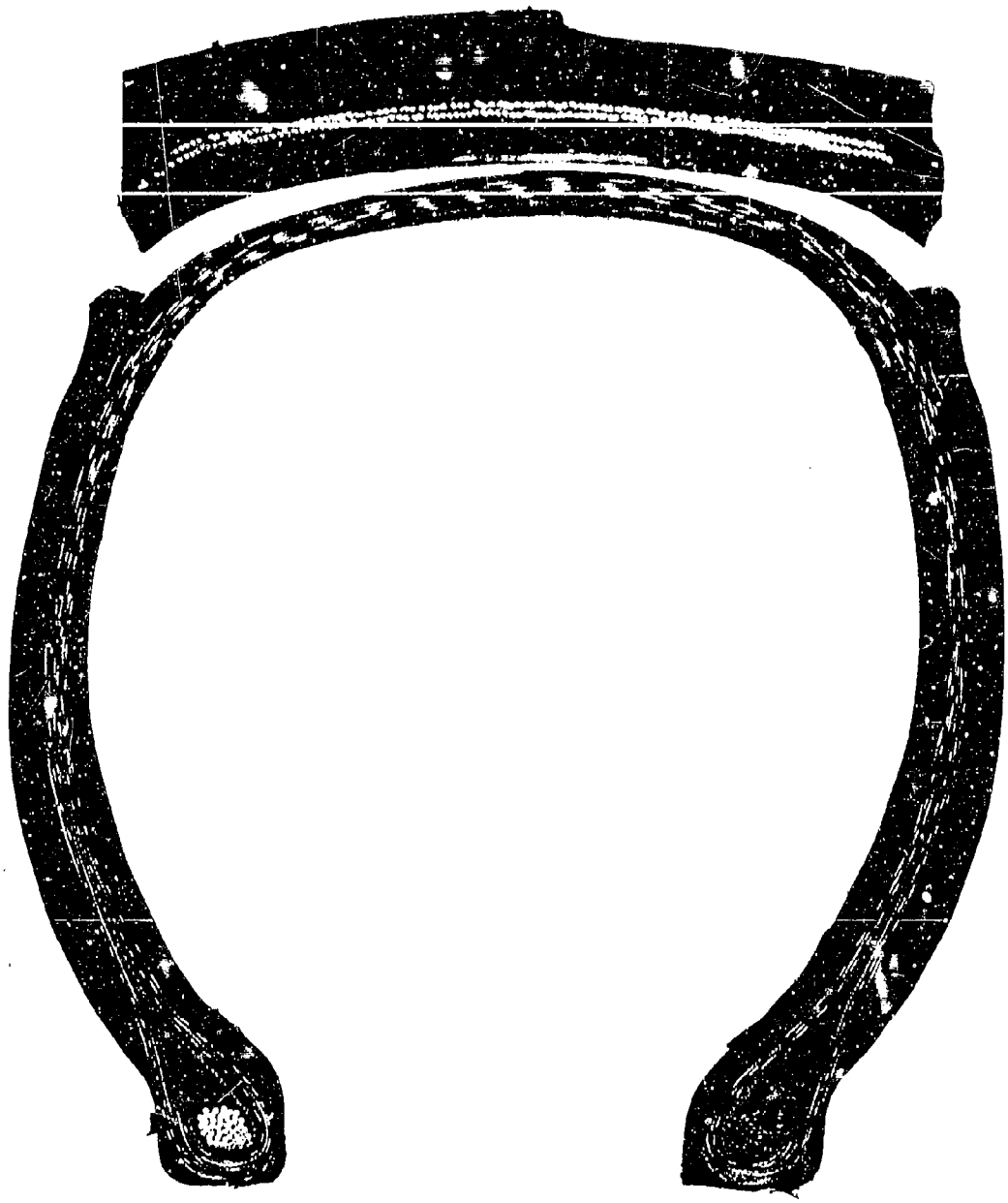
16--20
LOW PROFILE RADIAL PLY TIRE SECTION
FIGURE 3



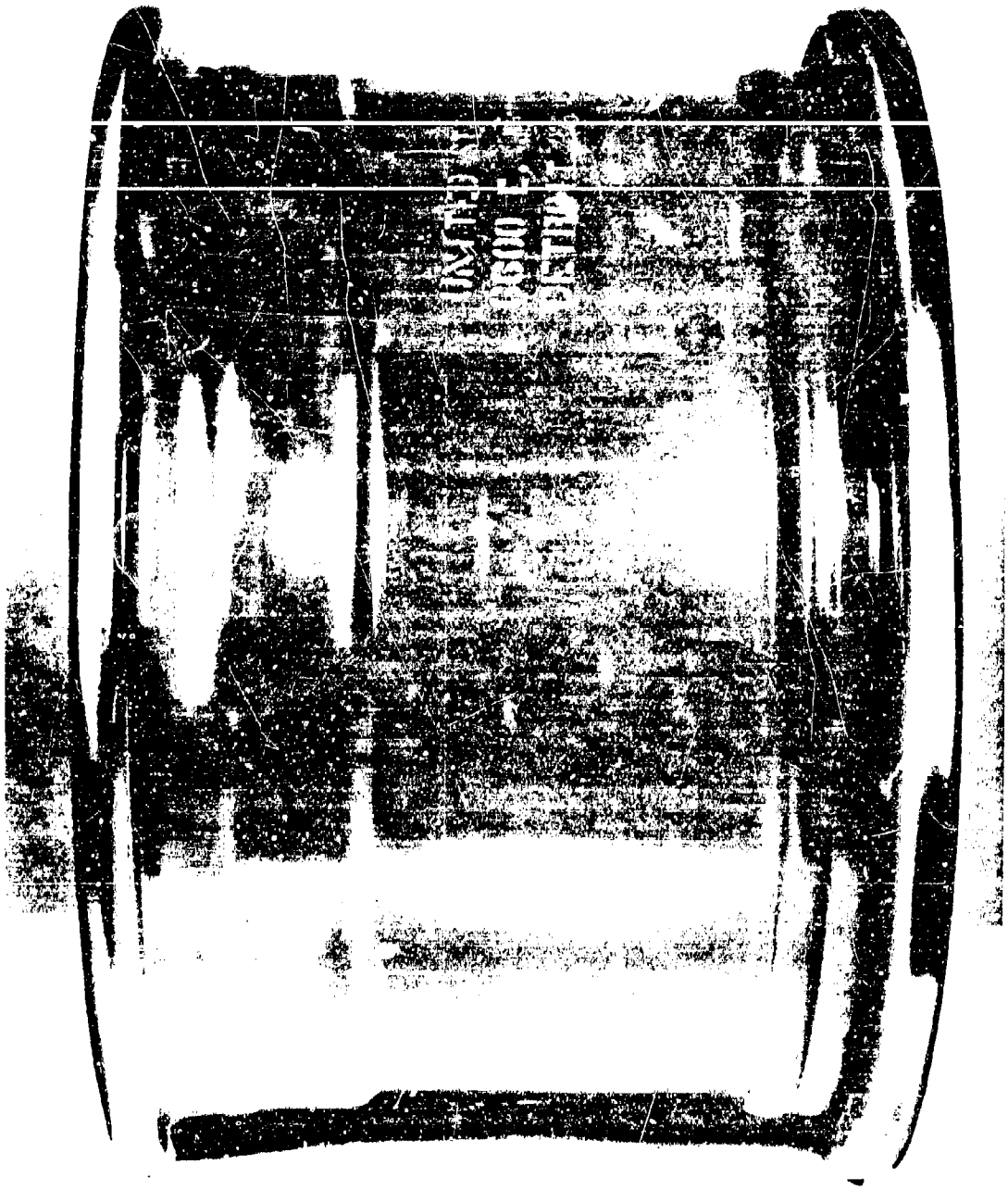
11.00–20
REPLACEABLE TREAD TIRE
FIGURE 4



11.00 20
REPLACEABLE TREAD AND CARCASS
FIGURE 5



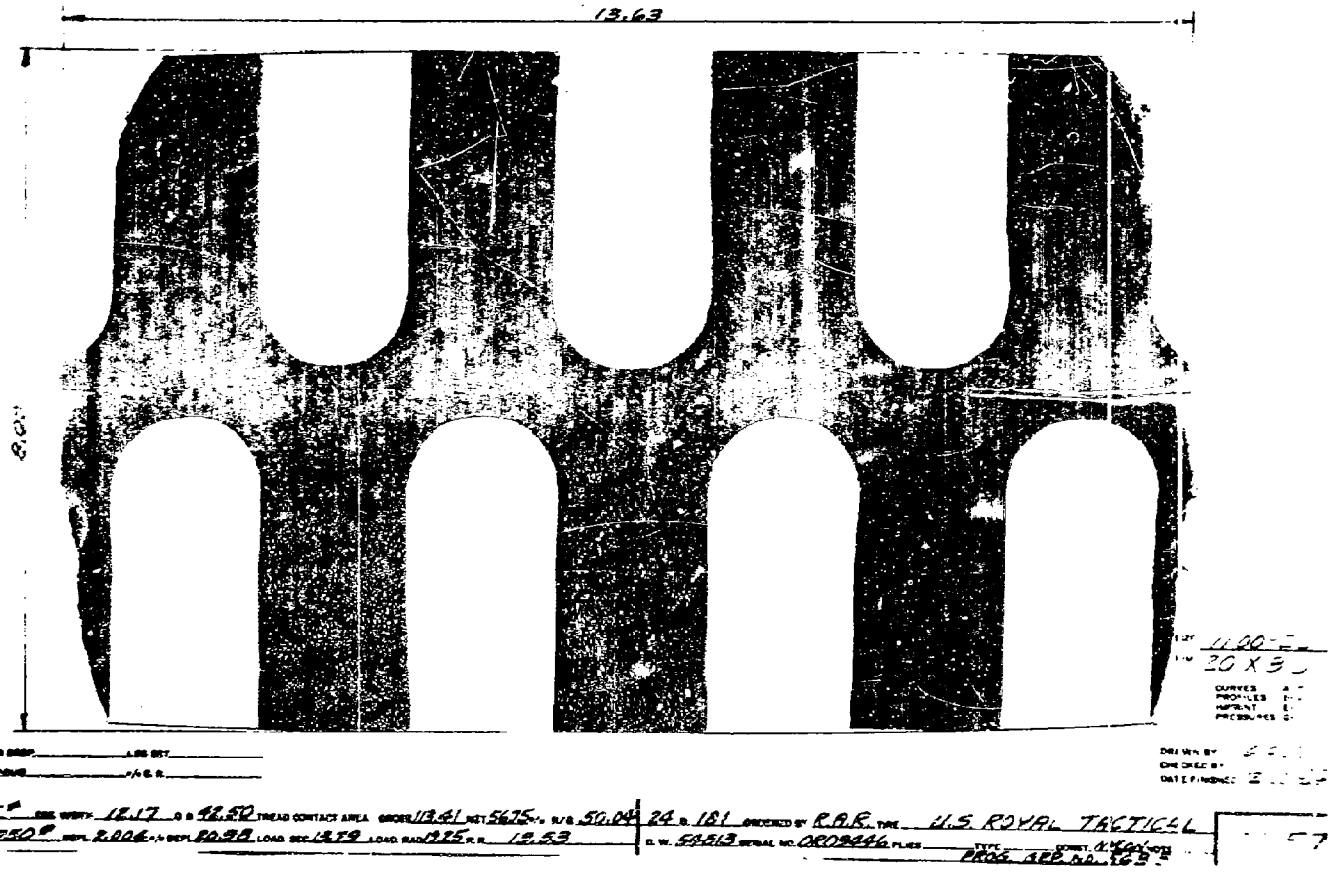
11.00—20
REPLACEABLE TREAD TIRE SECTION
FIGURE 6



MODIFIED SAFETY HUMP. SEMI-DROP CENTER RIM

20 x 12.00 for 16-20/10 P.R. NDCC RADIAL PLY LOW PROFILE TIRE

Figure 7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PROJ. APP. NO. 163

FIGURE 8

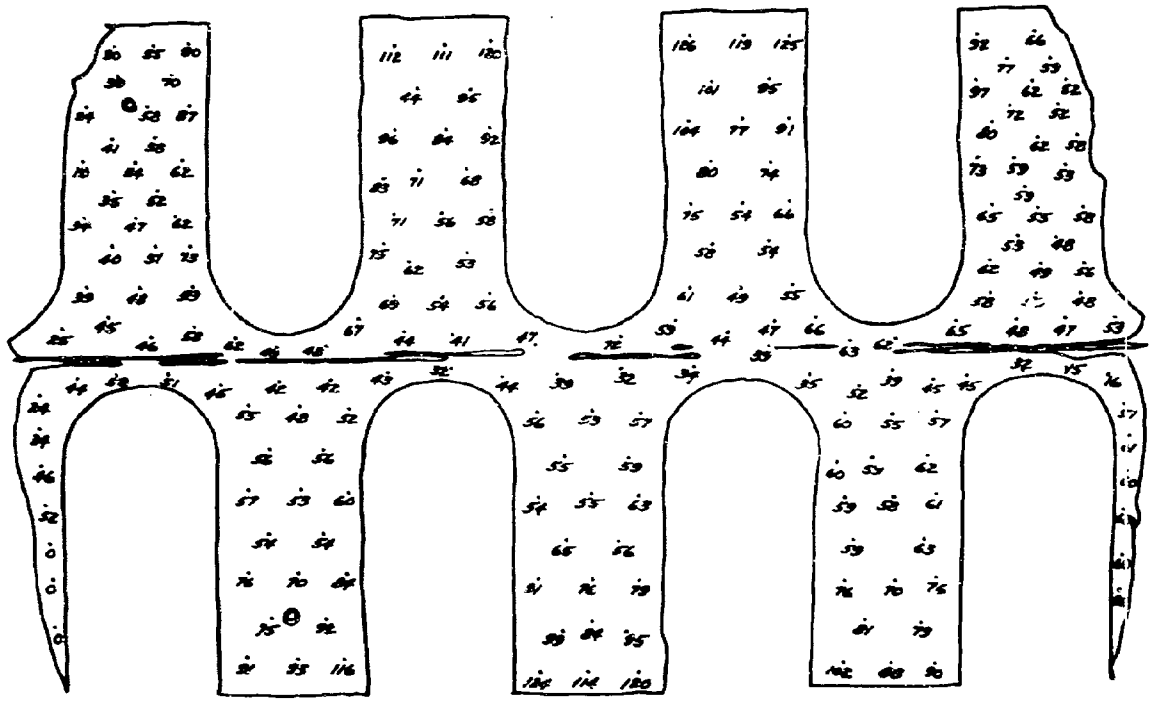


FIGURE 9

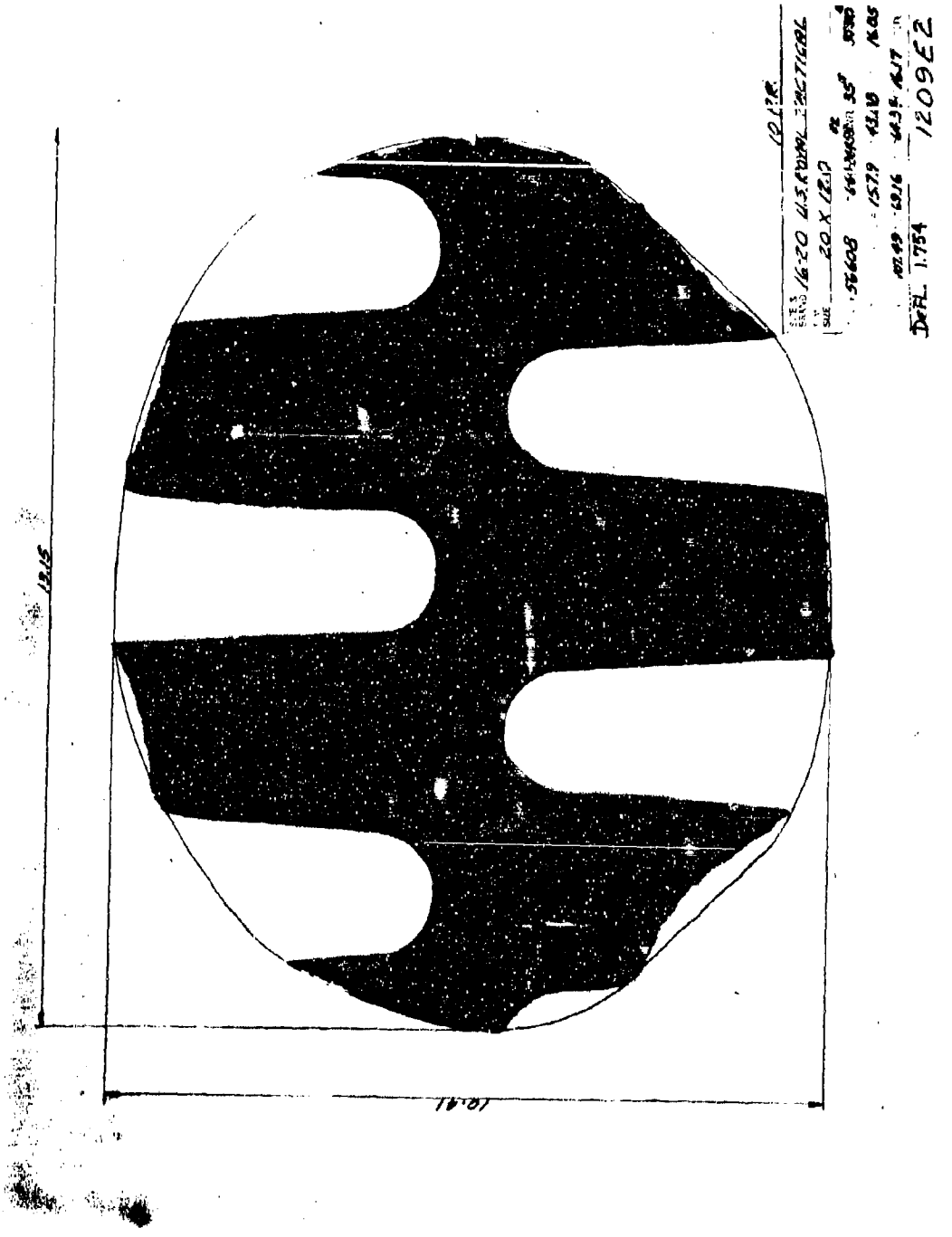


FIGURE 10

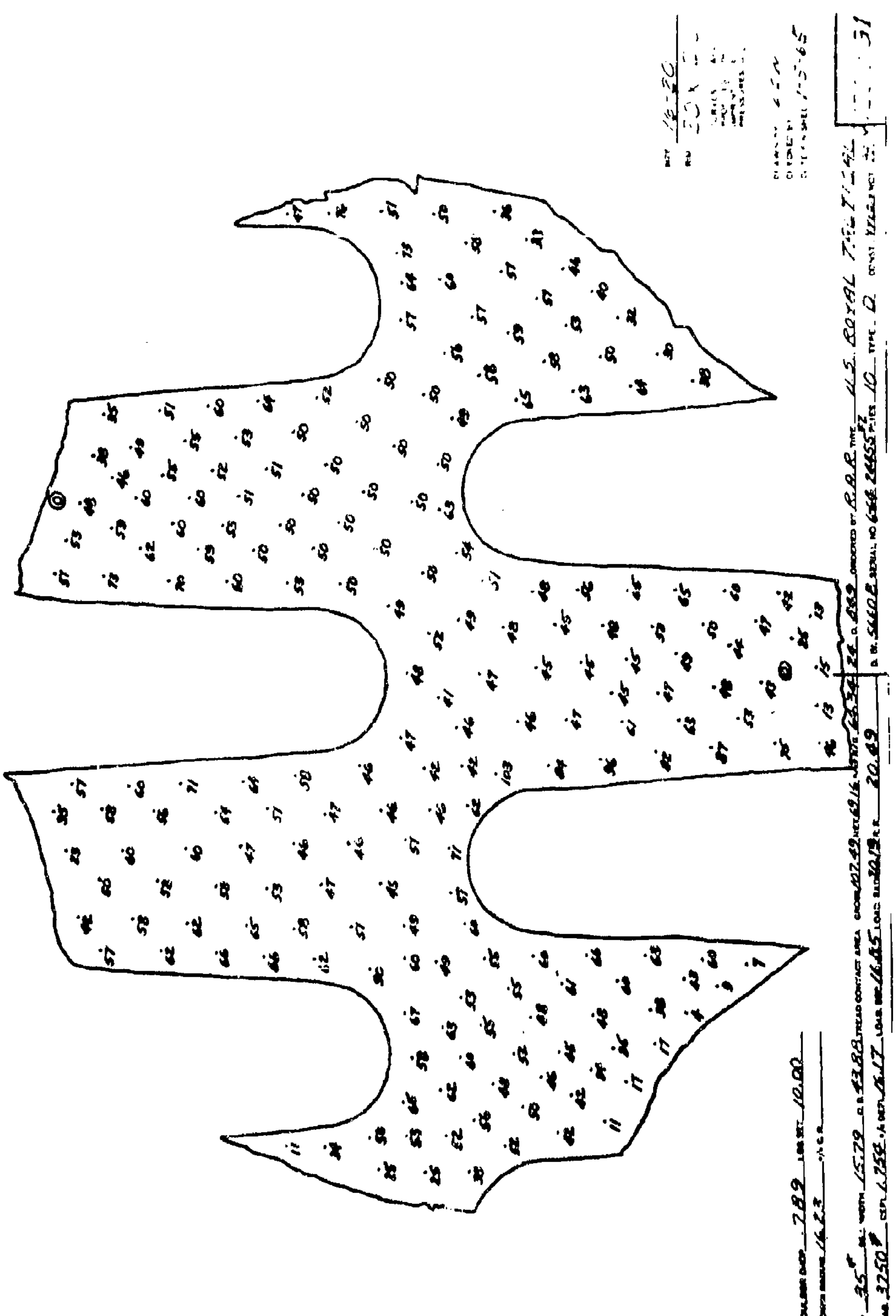


FIGURE 11

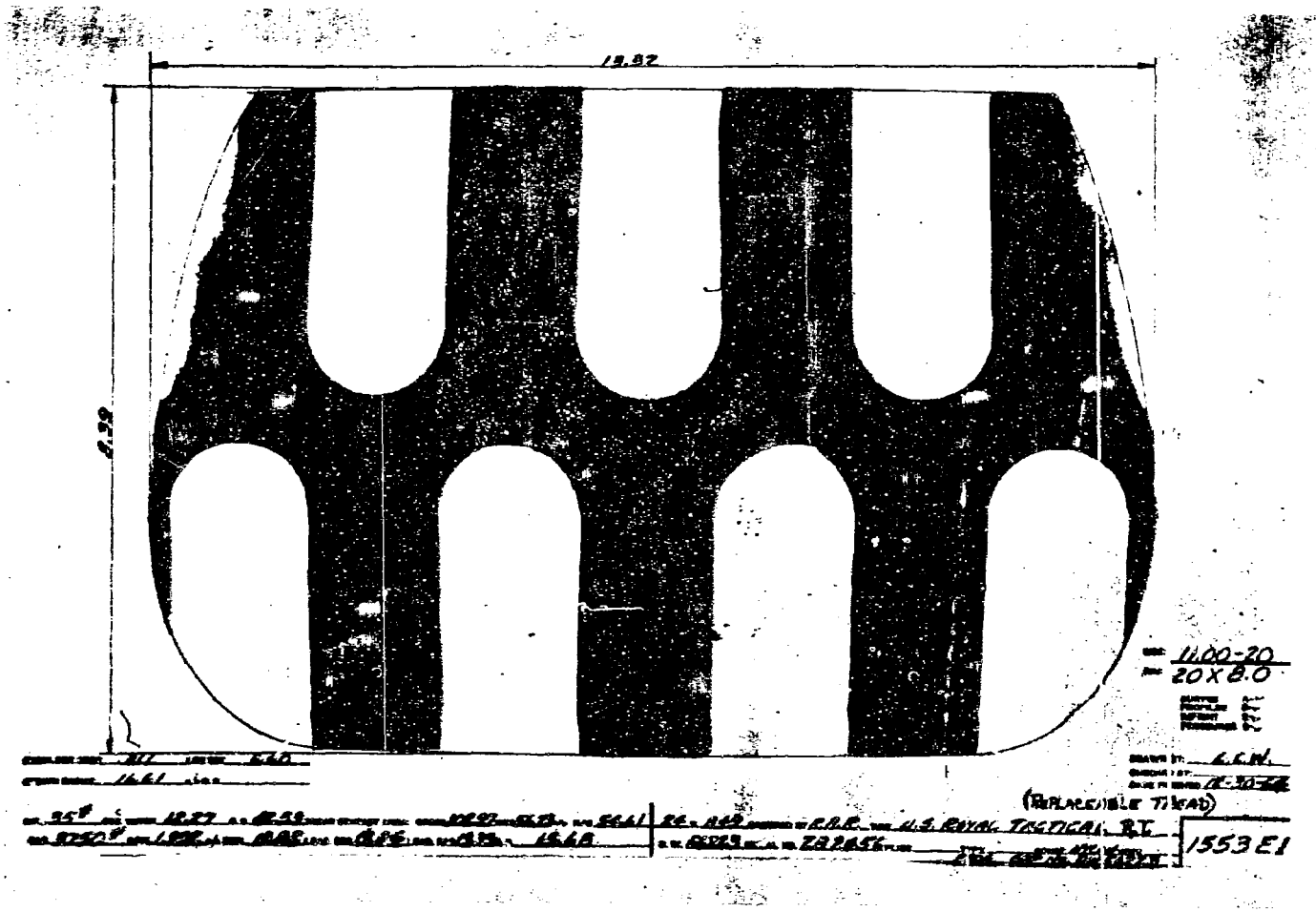


FIGURE 12

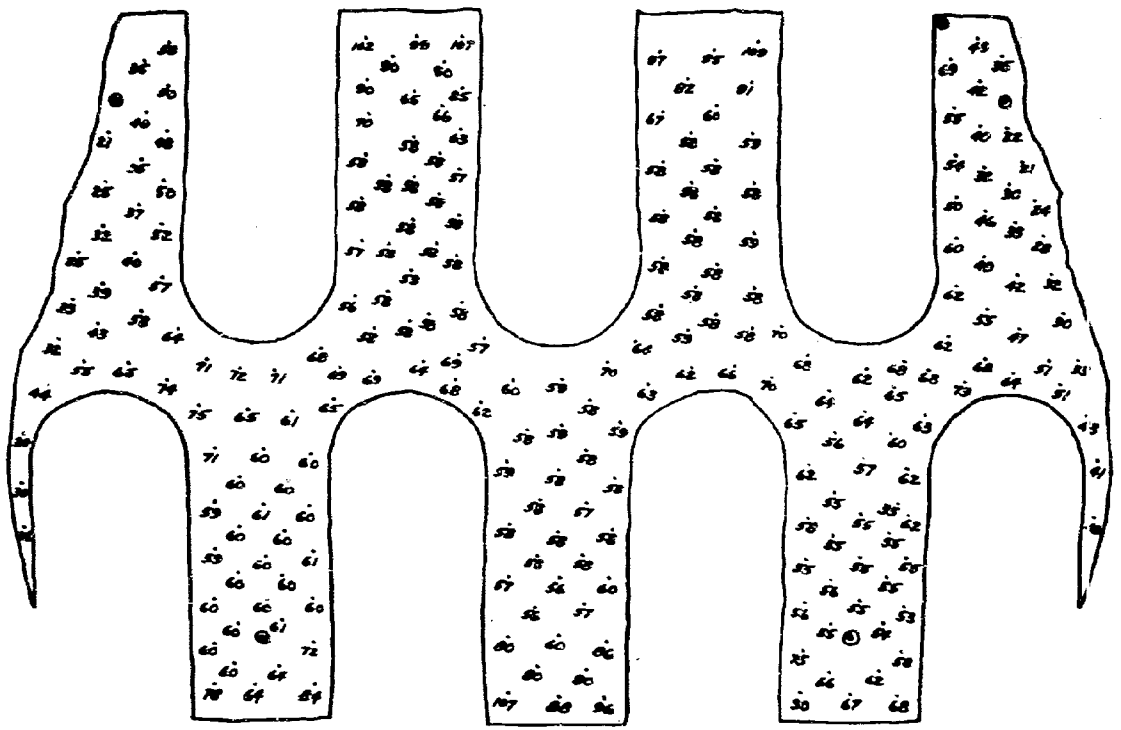


FIGURE 13

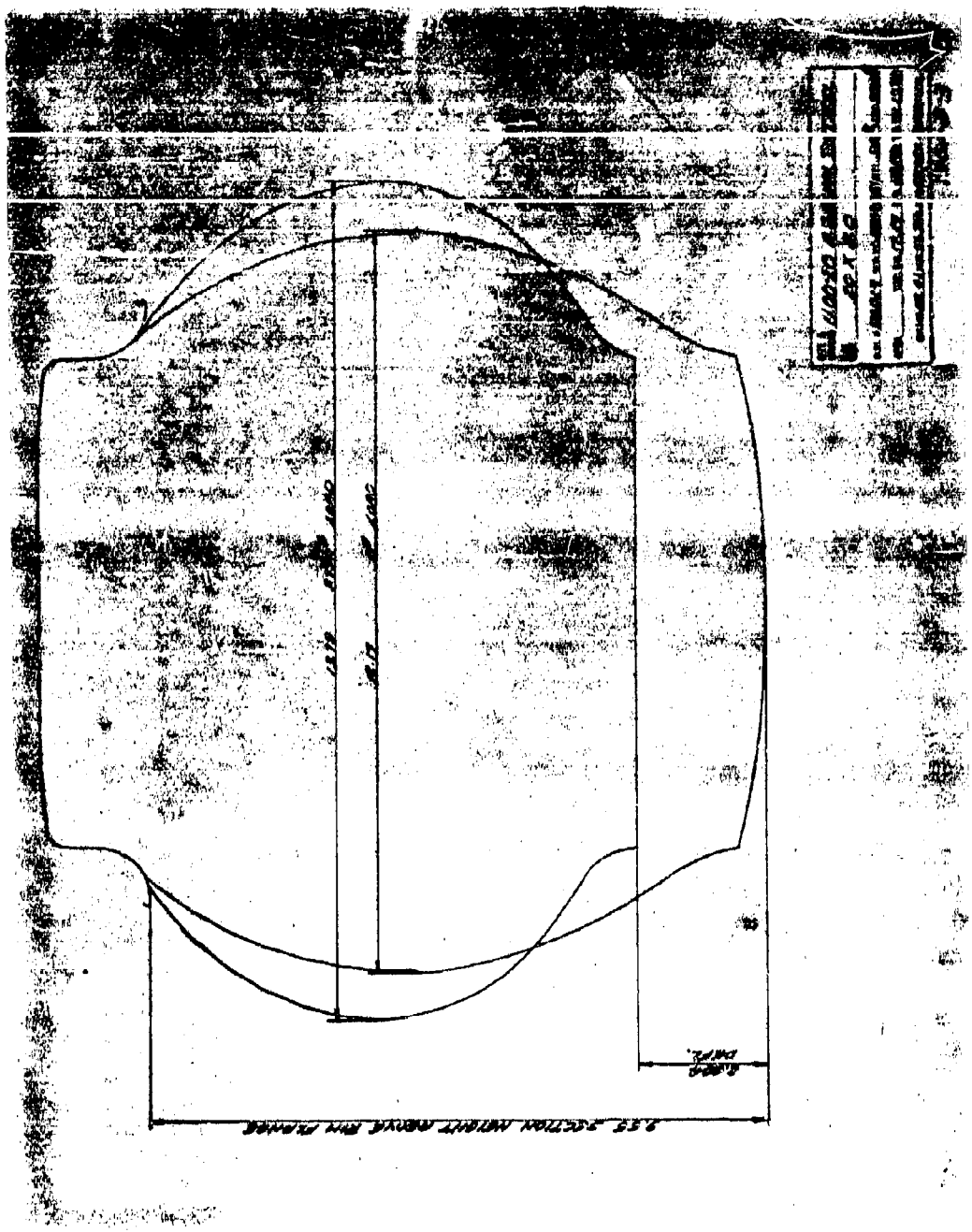


FIGURE 14

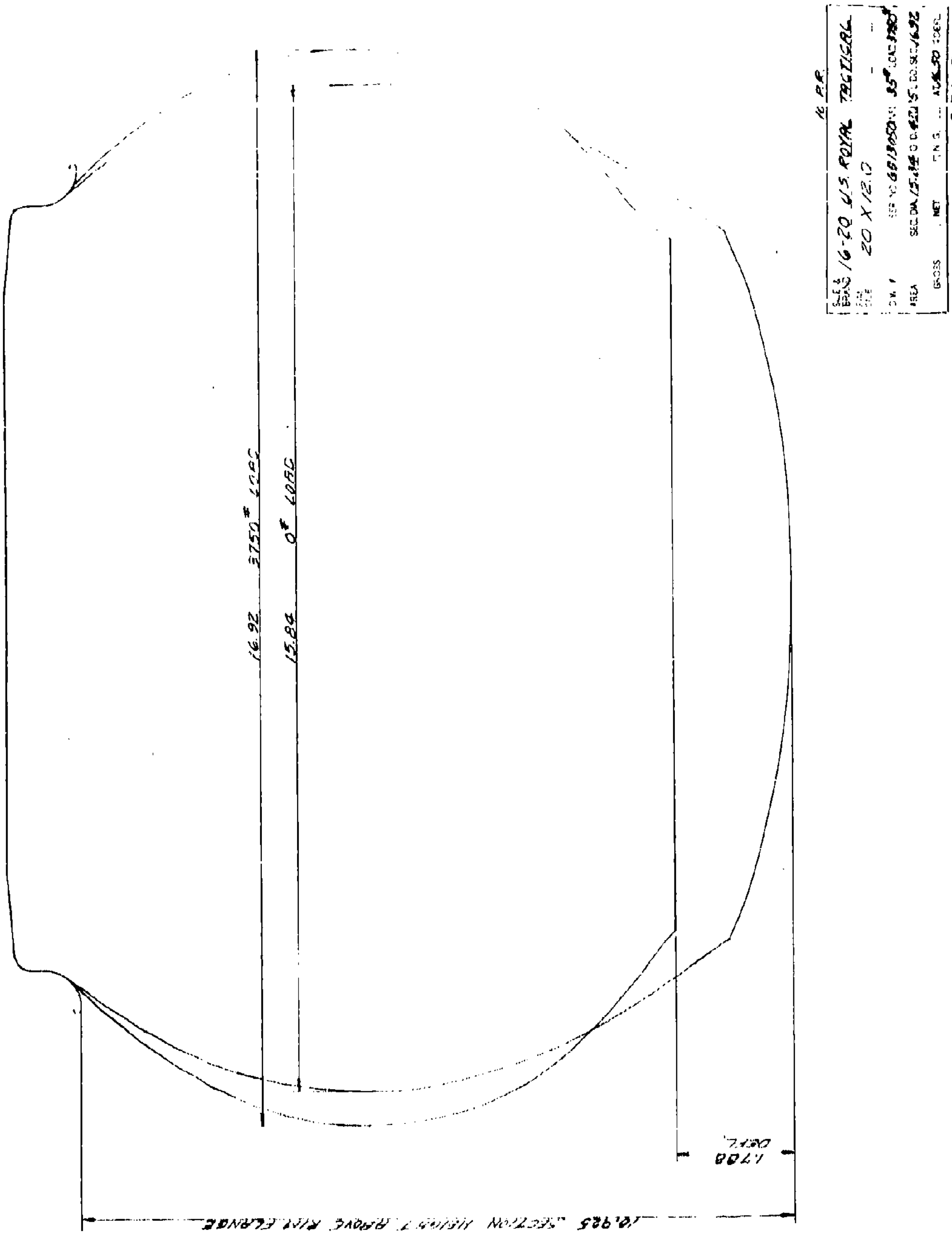


FIGURE 15

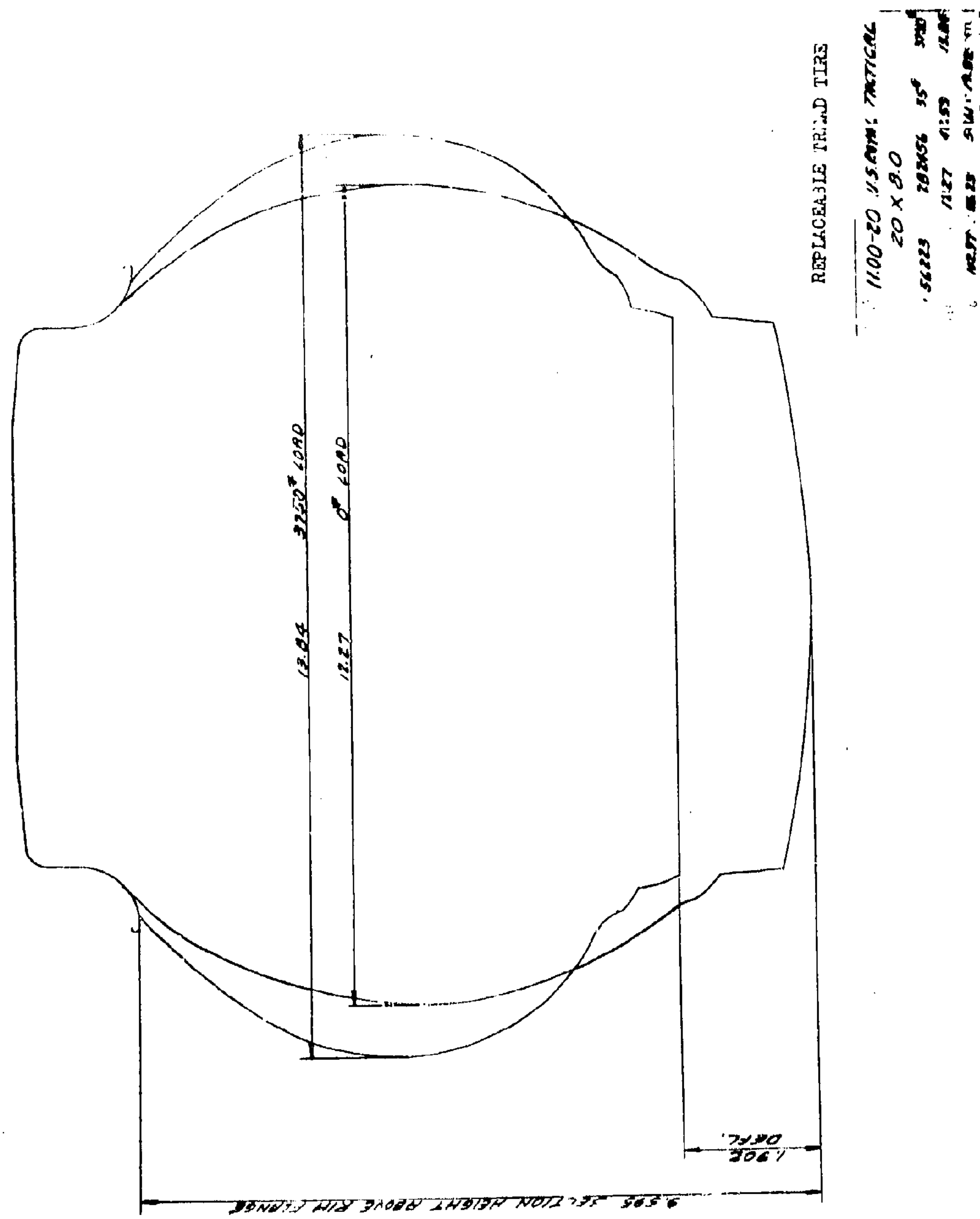
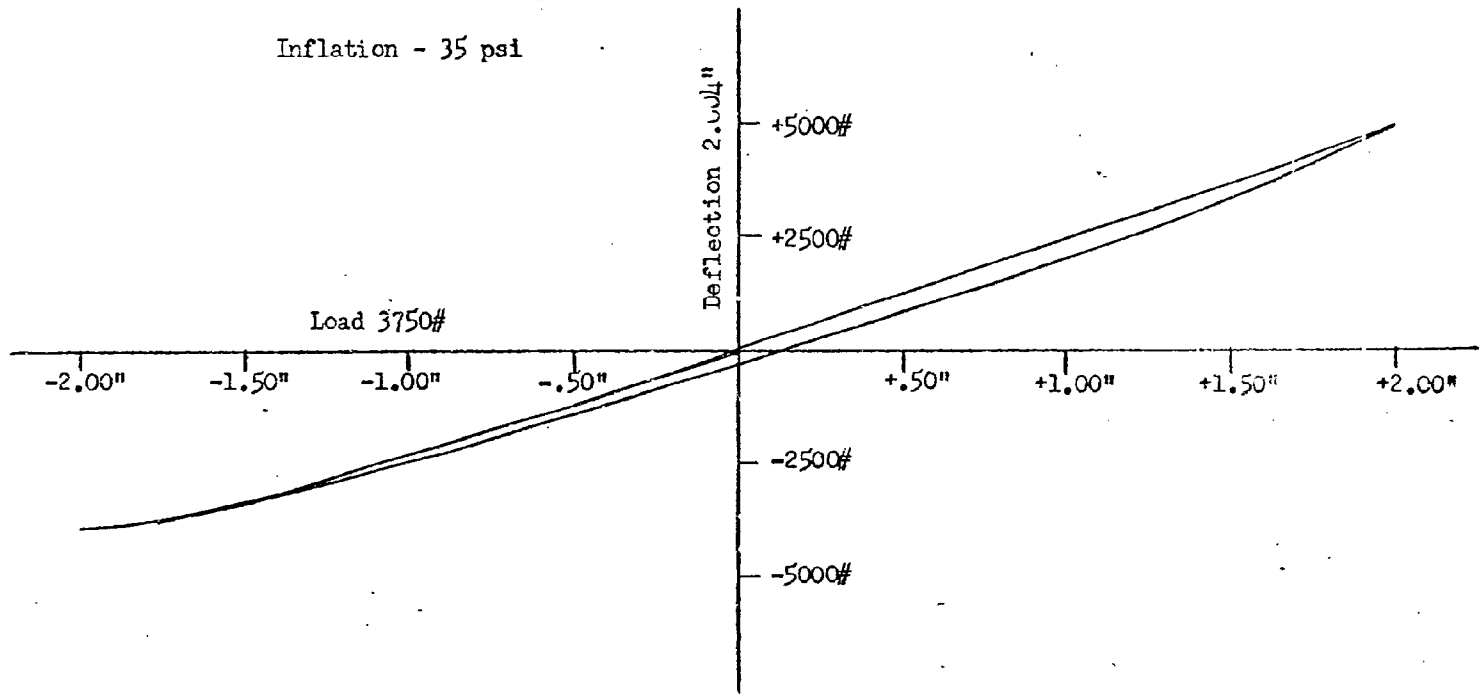
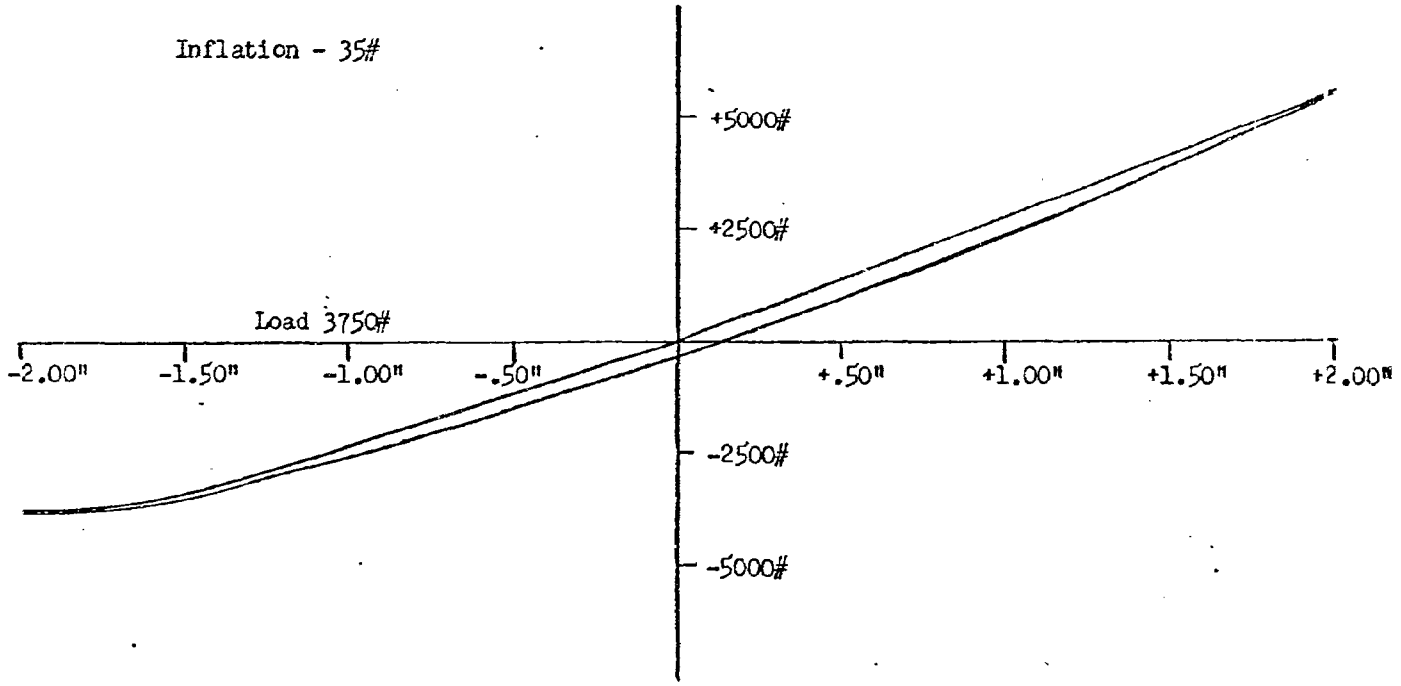

REPLACEABLE TREAD TIRE
20 X 8.0
1553-B-1
13.84
3250# LOAD
12.27
0# LOAD
DEFL.
SECTION HEIGHT ABOVE RIM FLANGE

FIGURE 16



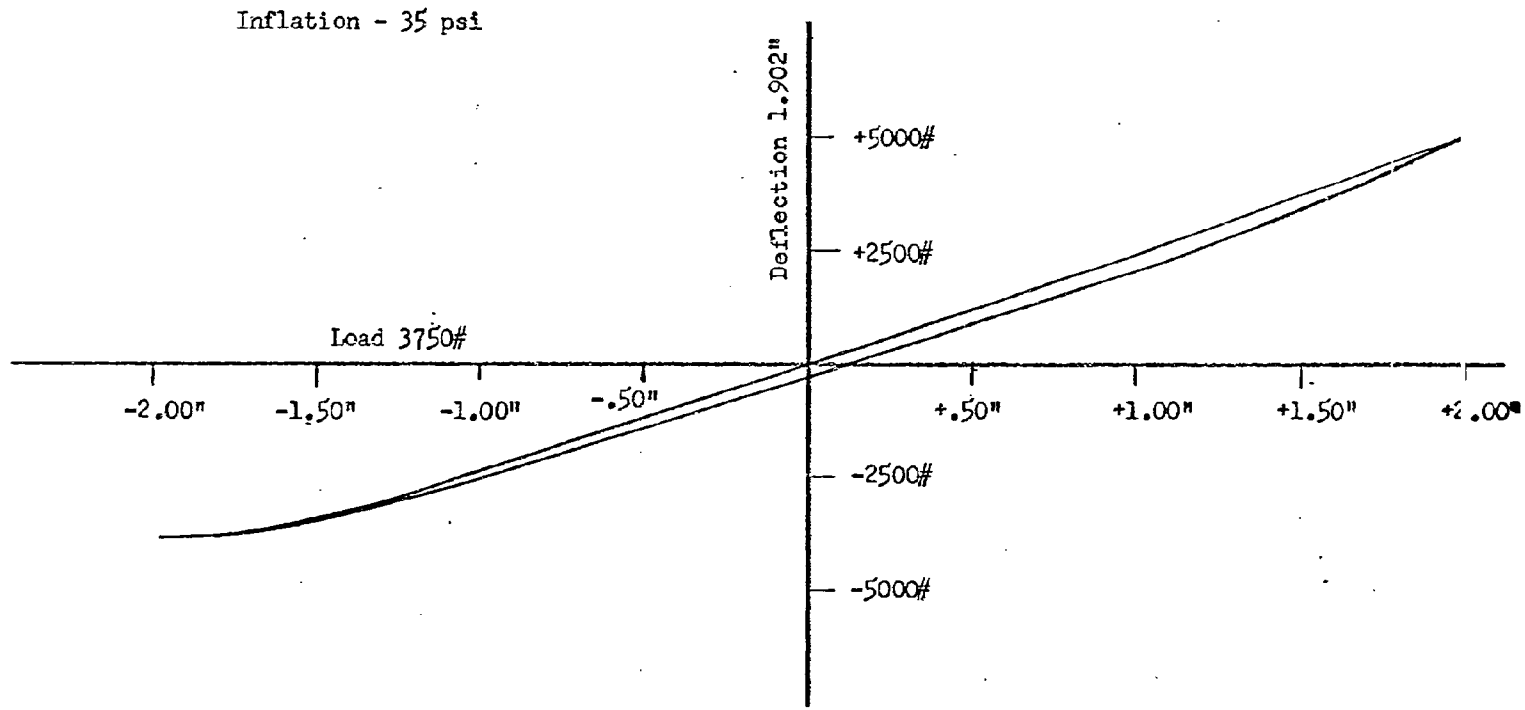
Closed Loop Load
Deflection Curve for the
U. S. Royal Radial
Tactical Integral Tire
Nylon Carcass (6 Ply) Wire Belt
11.00-20/12P.R.

Figure 17



Closed Loop Load
Deflection Curve for the
16-20/10P.R. U.S. Royal Radial Tactical
Nylon Carcass (6Ply) Wire Belt

Figure 18



Closed Loop Load
Deflection Curve for the
U.S. Royal Radial Tactical
Replaceable Tread Tire
Nylon Carcass (6 Ply) Wire Belt
11.00-20/12P.R.

Figure 19

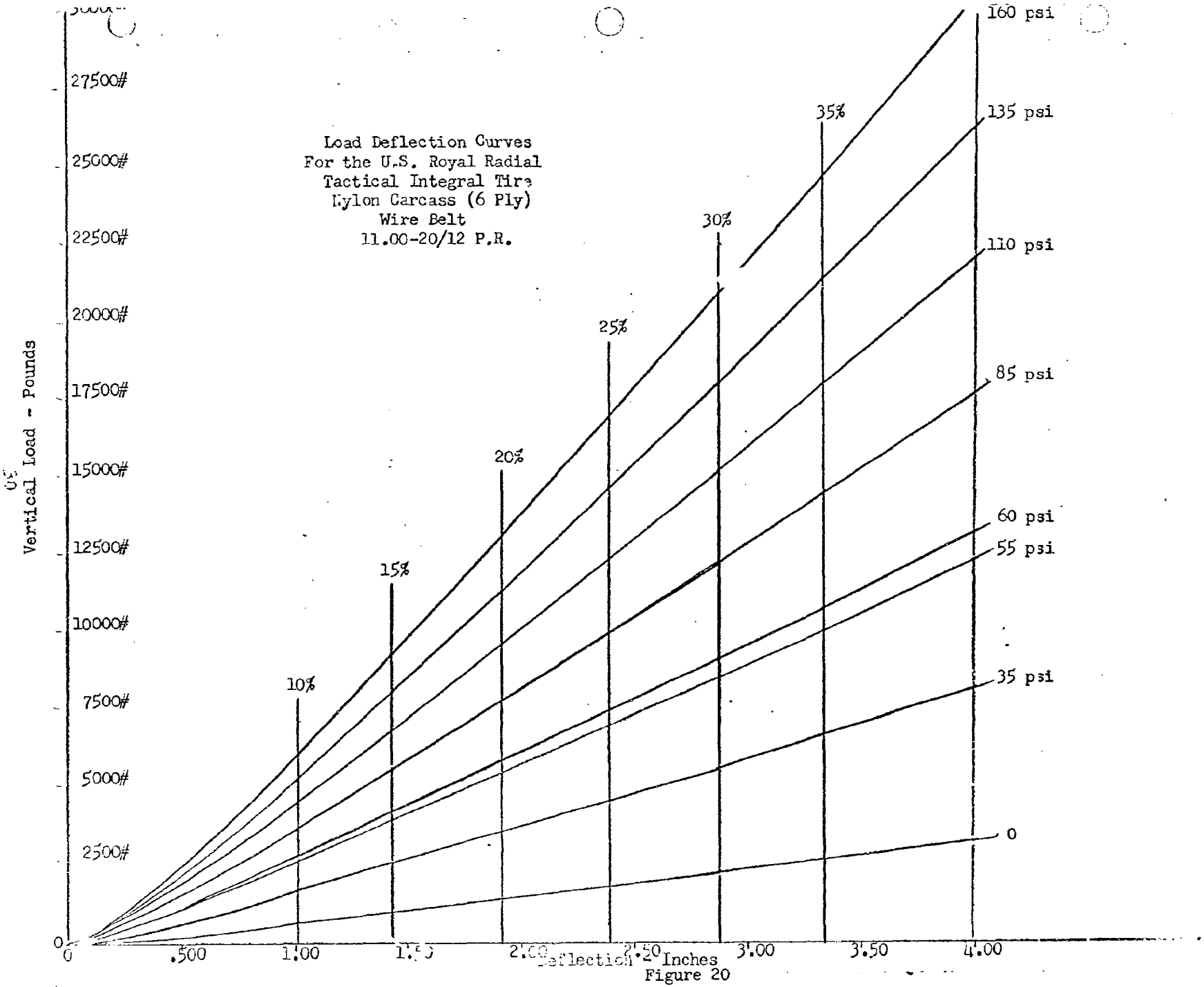

Load Deflection Curves
For the U.S. Royal Radial
Tactical Integral Tire
Nylon Carcass (6 Ply)
Wire Belt
11.00-20/12 P.R.
Vertical Load - Pounds
27500#
25000#
22500#
20000#
17500#
15000#
12500#
10000#
7500#
5000#
2500#
0
10%
15%
20%
25%
30%
35%
160 psi
135 psi
110 psi
85 psi
60 psi
55 psi
35 psi
0
.500
1.00
2.50
3.00
3.50
4.00
Deflection - Inches

Figure 20

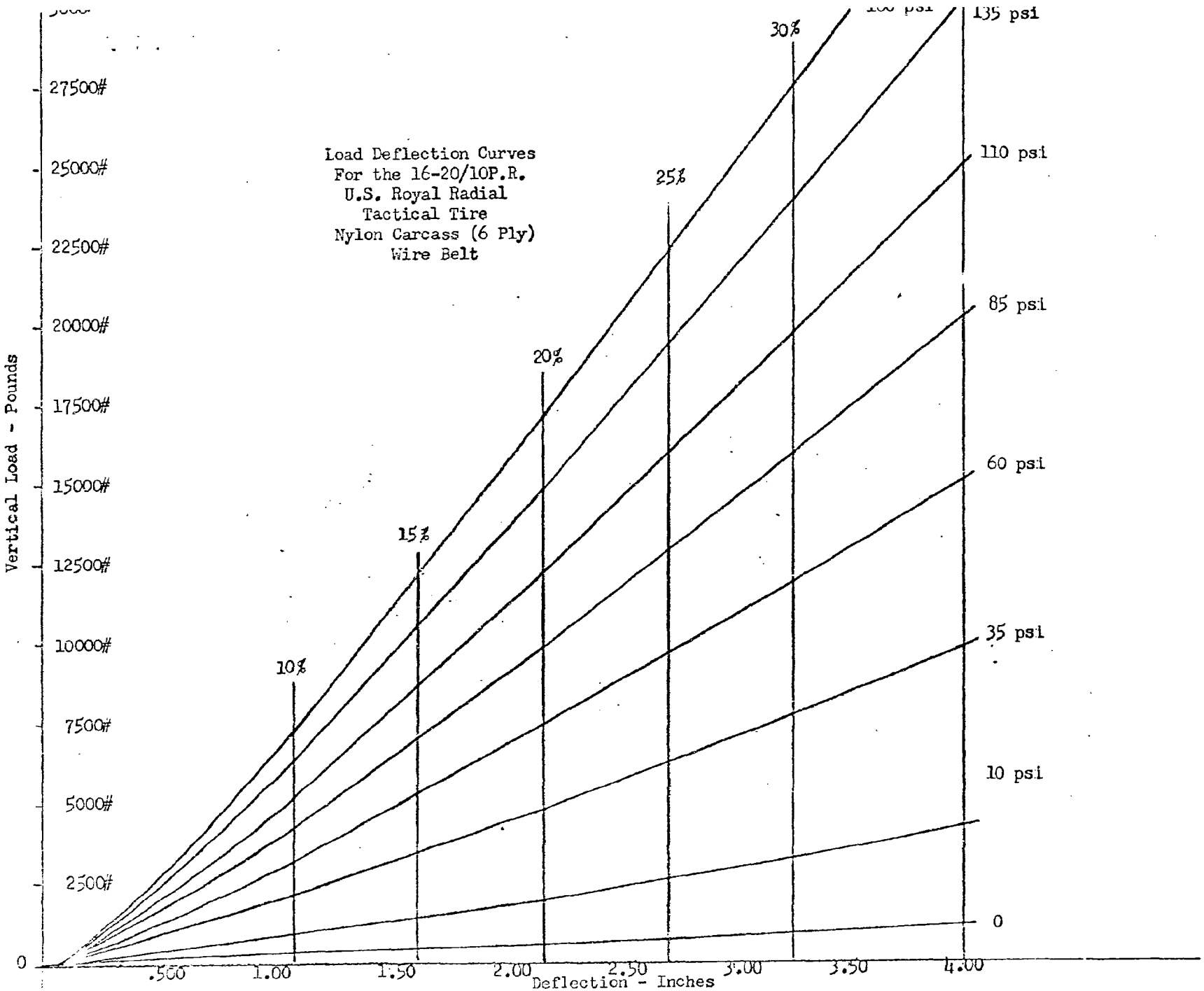

Load Deflection Curves
For the 16-20/10P.R.
U.S. Royal Radial
Tactical Tire
Nylon Carcass (6 Ply)
Wire Belt
Vertical Load - Pounds
27500#
25000#
22500#
20000#
17500#
15000#
12500#
10000#
7500#
5000#
2500#
0
10%
15%
20%
25%
30%
135 psi
110 psi
85 psi
60 psi
35 psi
10 psi
0
.500
1.00
1.50
2.00
2.50
3.00
3.50
4.00
Deflection - Inches

Figure 21

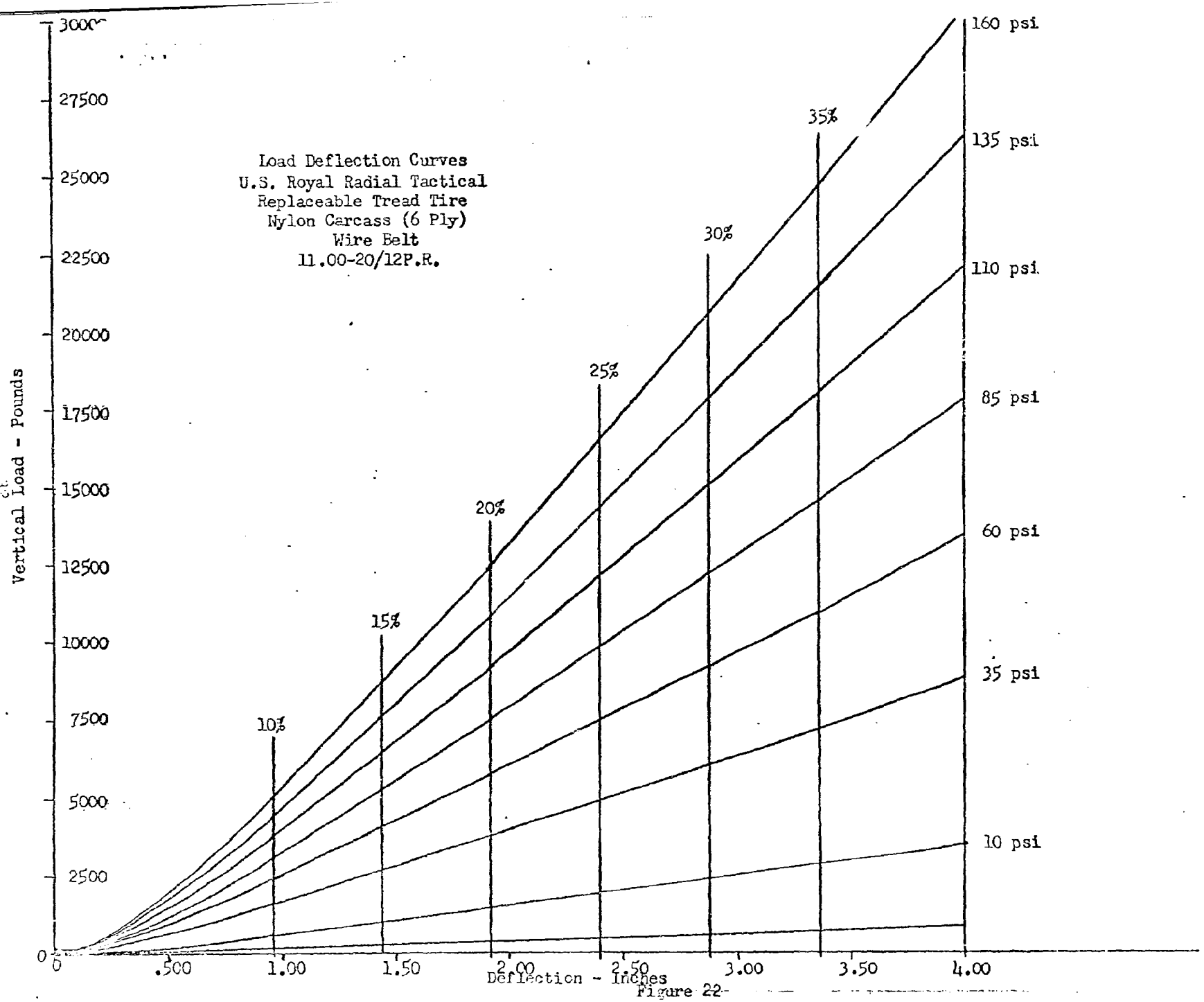

Load Deflection Curves
U.S. Royal Radial Tactical
Replaceable Tread Tire
Nylon Carcass (6 Ply)
Wire Belt
11.00-20/12P.R.
Vertical Load - Pounds
30000
27500
25000
22500
20000
17500
15000
12500
10000
7500
5000
2500
0
0
.500
1.00
1.50
2.00
2.50
3.00
3.50
4.00
Deflection - Inches
10%
15%
20%
25%
30%
35%
160 psi
135 psi
110 psi
85 psi
60 psi
35 psi
10 psi

Figure 22

AD _____ ACCESSION NO. _____

U. S. Rubber Tire Co., Detroit, Michigan
Development of Tires for the New Family of Medium Tactical Trucks, R. A. Reichert/E. D. Rogers-ATAC
Final Report Phases I and II
Contract No. DA 20-018-AMC-0585T
Phase I - Field testing of the 11.00-20 tires under the direction of the Army Tank Automotive Center revealed a much improved performance over previous radial tires tested.
Phase II - Conduct a radial ply tire evaluation of the 16-20 size tire featuring a wide base, low profile tire design. Perform a feasibility study of the tire concept in the 11.00-20 size tire, using a radial ply carcass construction in combination with a removable tread.

AD _____ ACCESSION NO. _____

U. S. Rubber Tire Co., Detroit, Michigan
Development of Tires for the New Family of Medium Tactical Trucks, R. A. Reichert/E. D. Rogers-ATAC
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AD _____ ACCESSION NO. _____

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Contract No. DA 20-018-AMC-0585T
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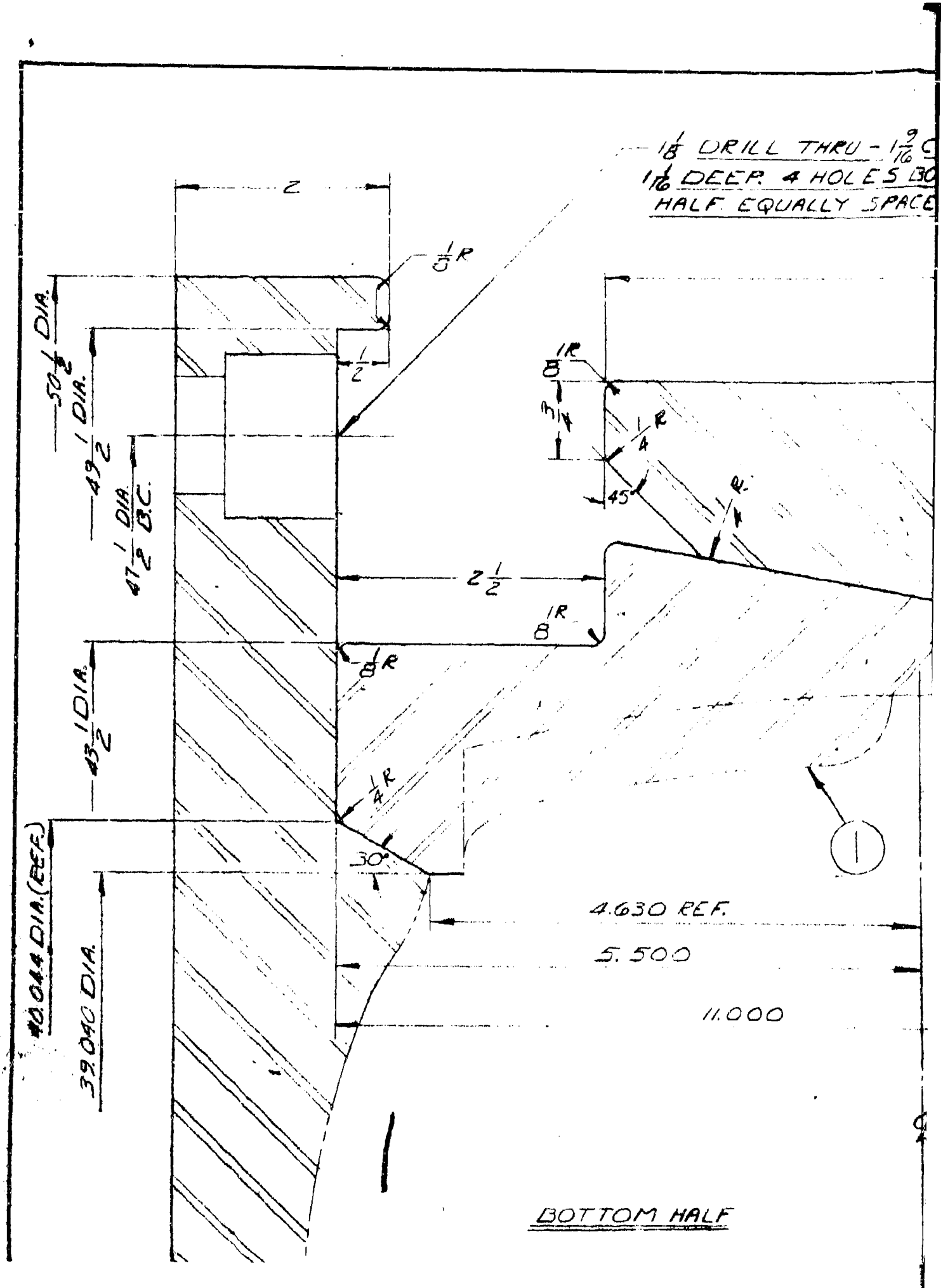
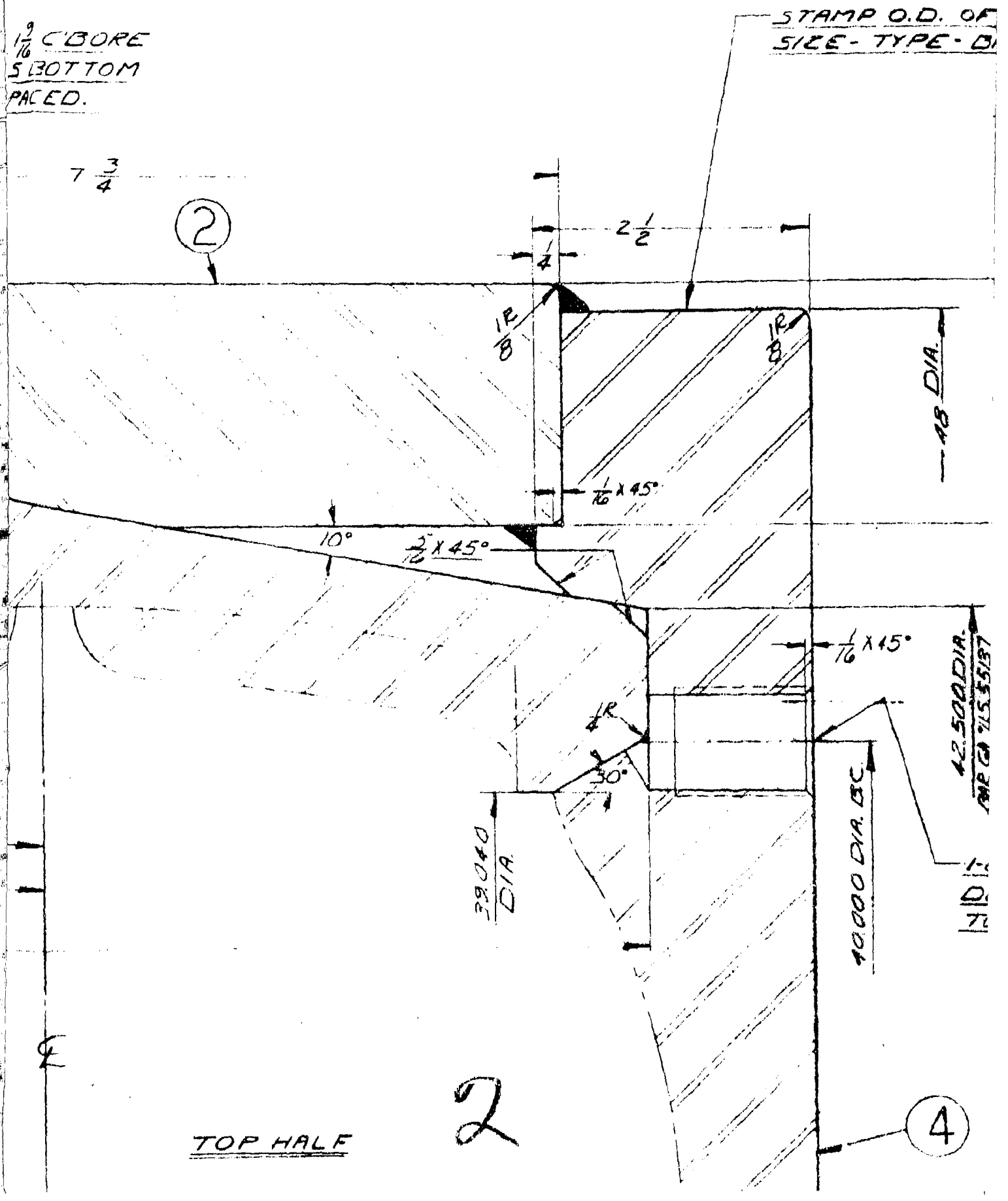
Phase II - Conduct a radial ply tire evaluation of the 16-20 size tire featuring a wide base, low profile tire design. Perform a feasibility study of the tire concept in the 11.00-20 size tire, using a radial ply carcass construction in combination with a removable tread.


1/8 DRILL THRU - 1 9/16 C
1 1/16 DEEP 4 HOLES
HALF EQUALLY SPACE
2
1/8 R
50 1/2 DIA.
49 1/2 DIA.
47 1/2 DIA. B.C.
43 1/2 DIA.
#0.044 DIA. (REF.)
39.040 DIA.
1/2
1R
3/4
1/4 R
45°
2 1/2
1R
1/8 R
1/4 R
30°
4.630 REF.
5.500
11.000
BOTTOM HALF


1 9/16 C'BORE
5 BOTTOM
PACED.
STAMP O.D. OF
SIZE - TYPE - D
7 3/4
2
2 1/2
1/4
1R/8
1R/8
1.8 DIA.
1/16 X 45°
10°
3/32 X 45°
1/16 X 45°
1R
30°
42.5040 DIA.
39.040 DIA.
40.000 DIA. BC.
TOP HALF
2
4

F EACH PART THUS IN 2 PLACES
BRAND - SER. Nº PLY

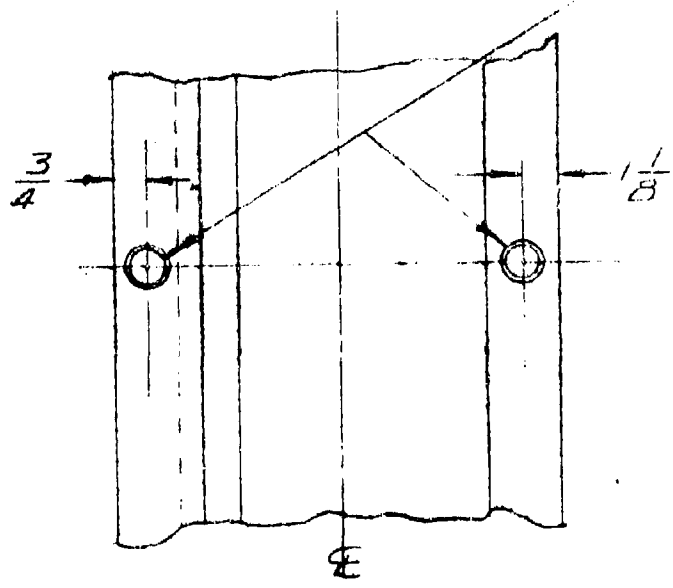
48 1/2 DIA.

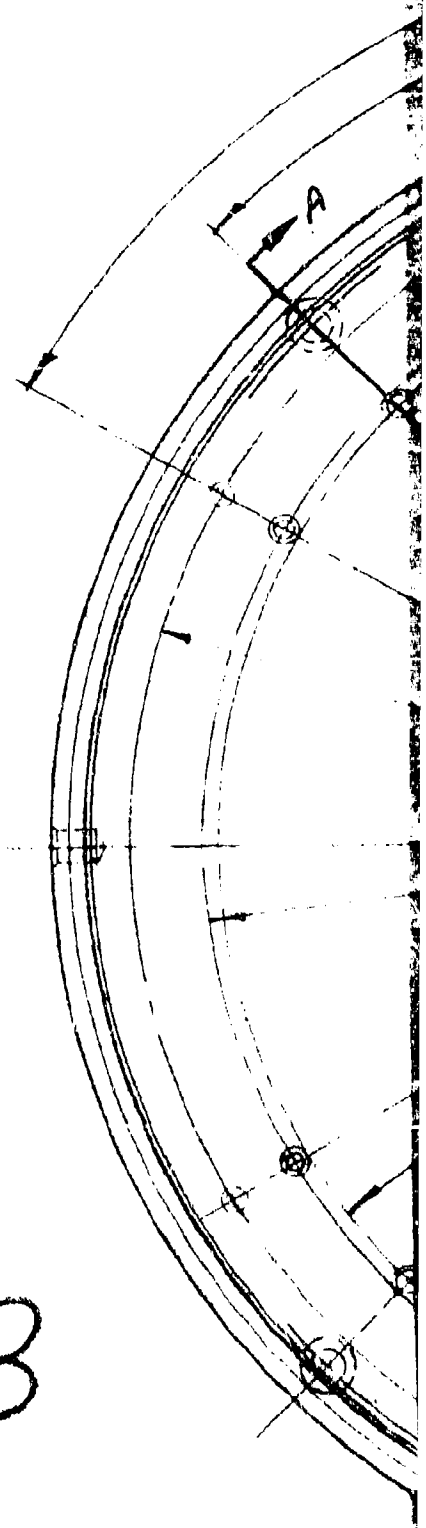
14 DIA.

BAE GA 115.5537

-8 N.C. TAP - 1 1/4
DEEP - 4 HOLES
TOP HALF.

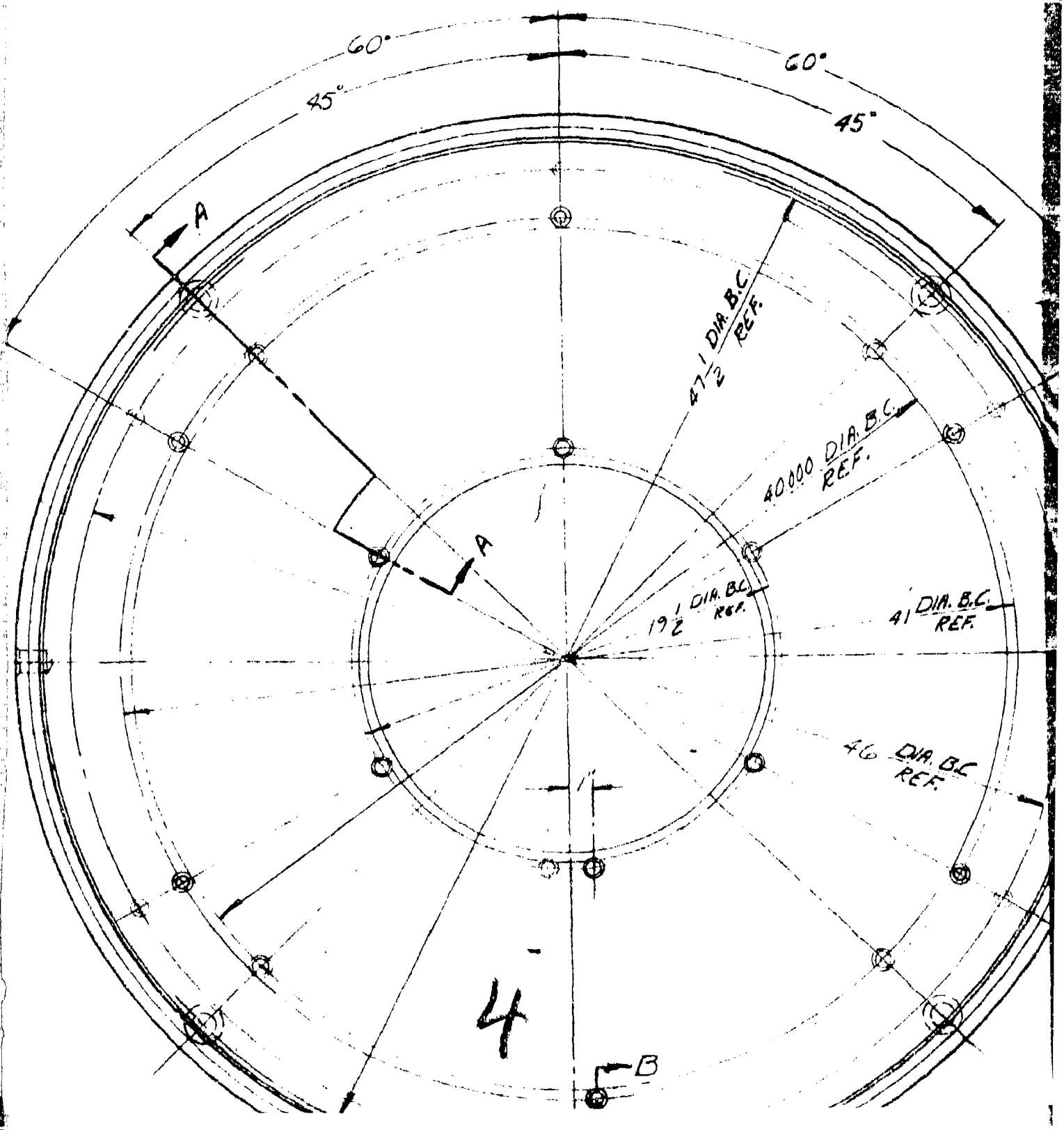
1 1/4 DRILL - 1 3/8 DEEP
1/16 X 45° CHAMFER
2 HOLES EACH HALF.



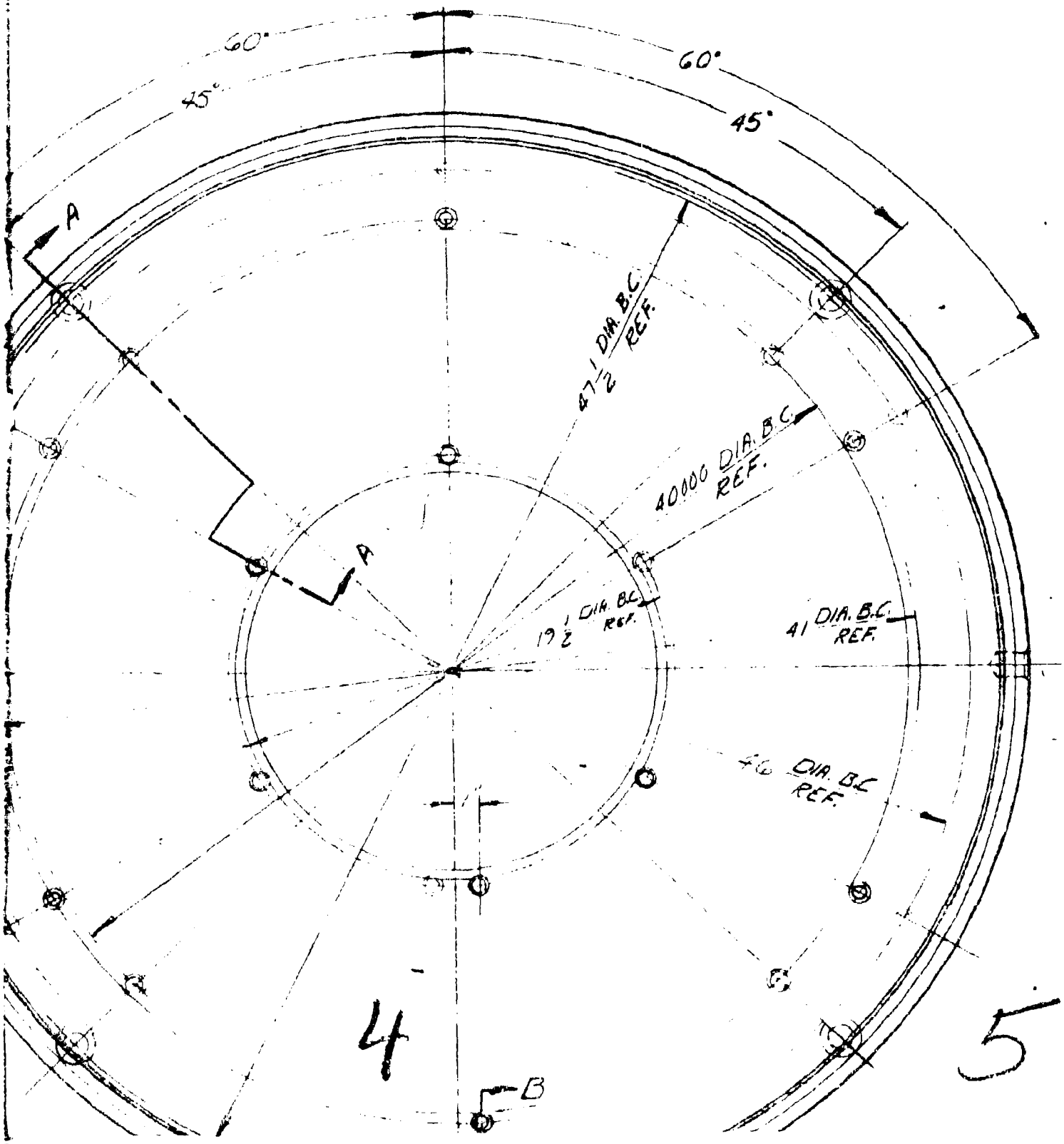


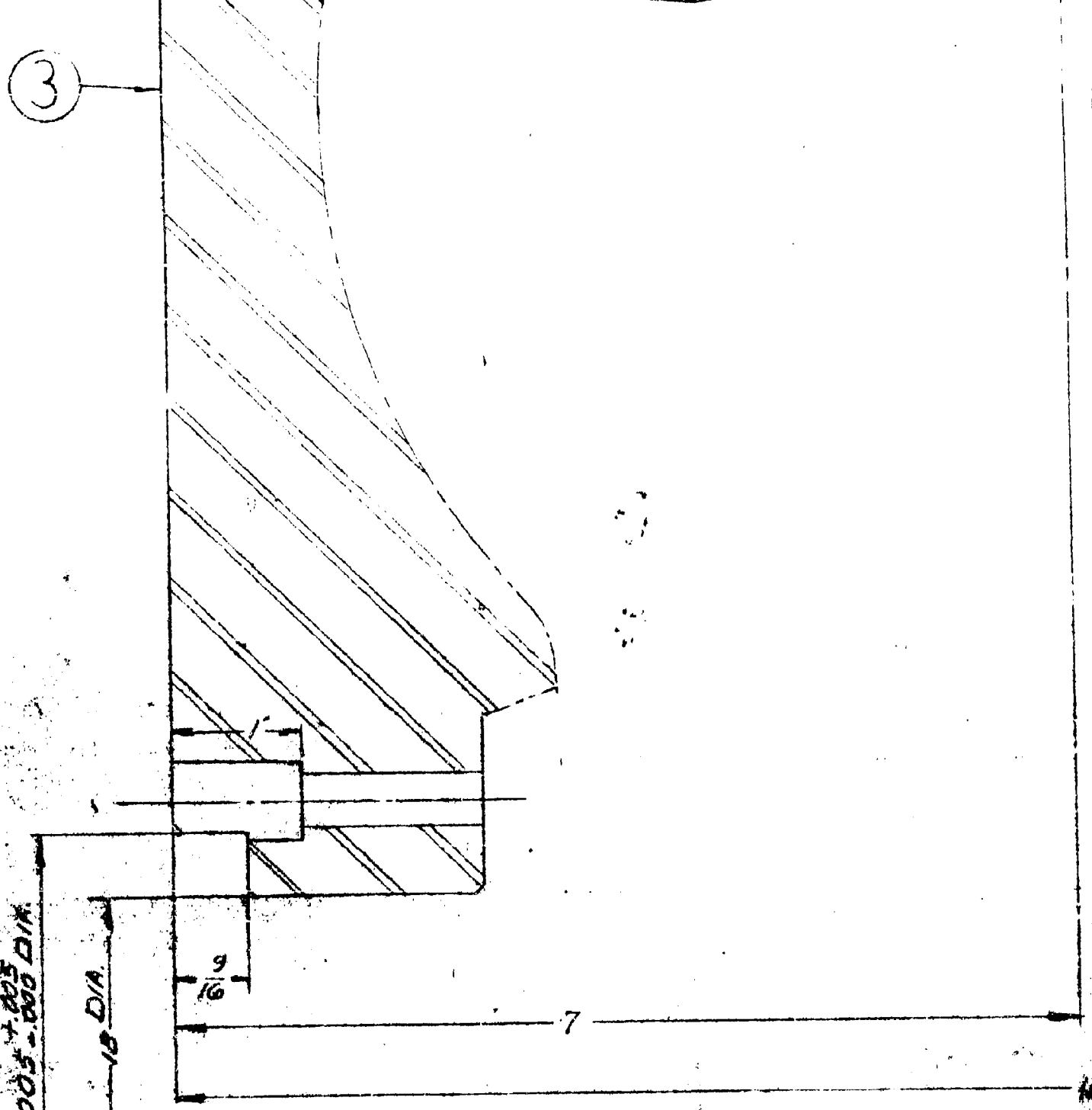
PRY BLOCK
2 REQ'D ON EACH TREAD
RING SEGMENT

3


60°
45°
60°
45°
A
A
47 1/2 DIA. B.C. REF.
40.000 DIA. B.C. REF.
19 1/2 DIA. B.C. REF.
41 DIA. B.C. REF.
46 DIA. B.C. REF.
B

4


60°
45°
60°
45°
A
A
47 1/2 DIA. B.C. REF.
40000 DIA. B.C.
19 1/2 DIA. B.C. REF.
41 DIA. B.C. REF.
B
4
5

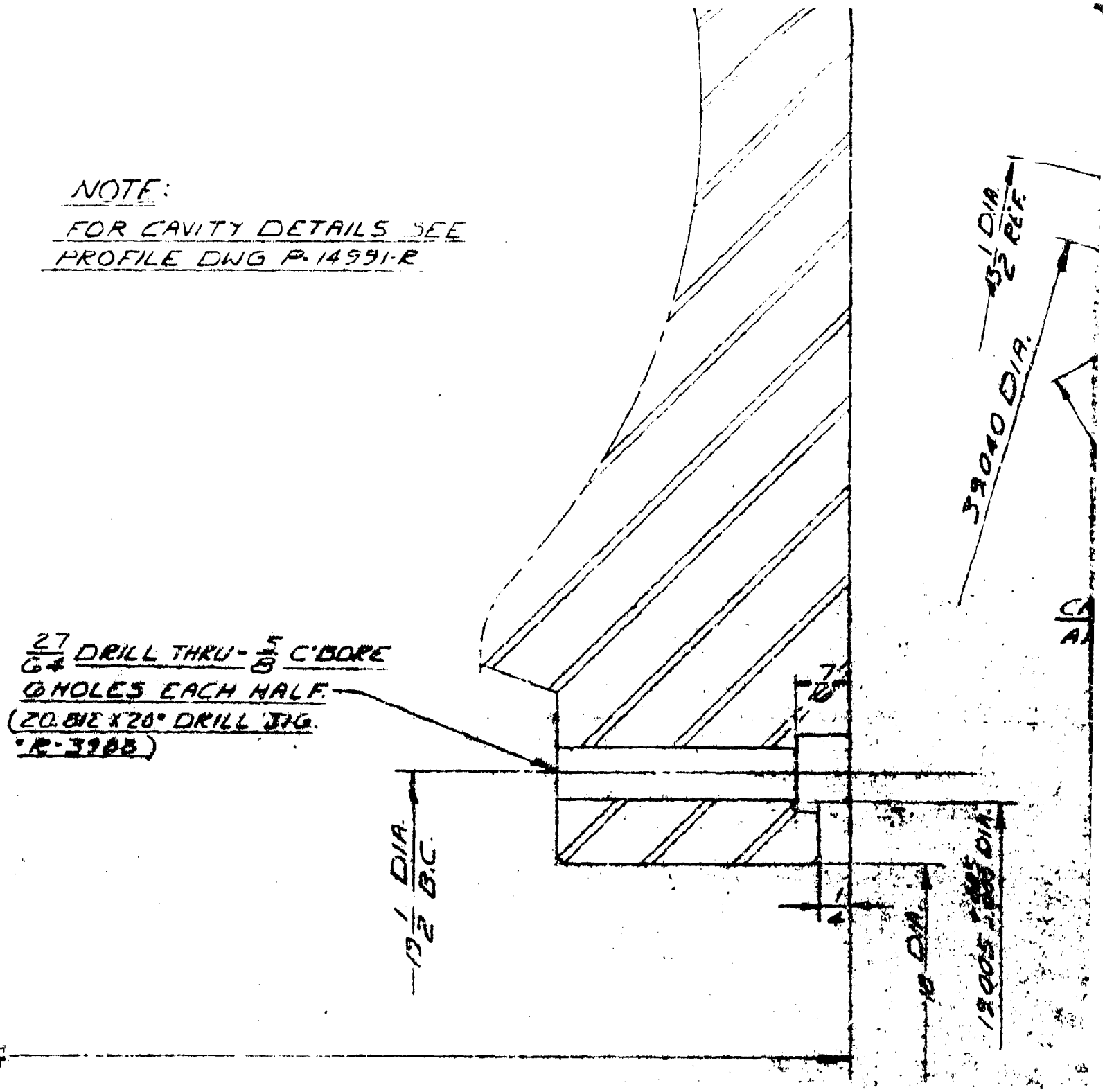


SECTIO
FULL S

ITEM No.	DESCRIPTION	MA
5	PRY BLOCKS	S
4	TOP HALF MOLD	STE OR C
3	BOTTOM HALF MOLD	STE
2	REGISTER RING	STE
1	TREAD RING SEGMENT	STE OR C

6

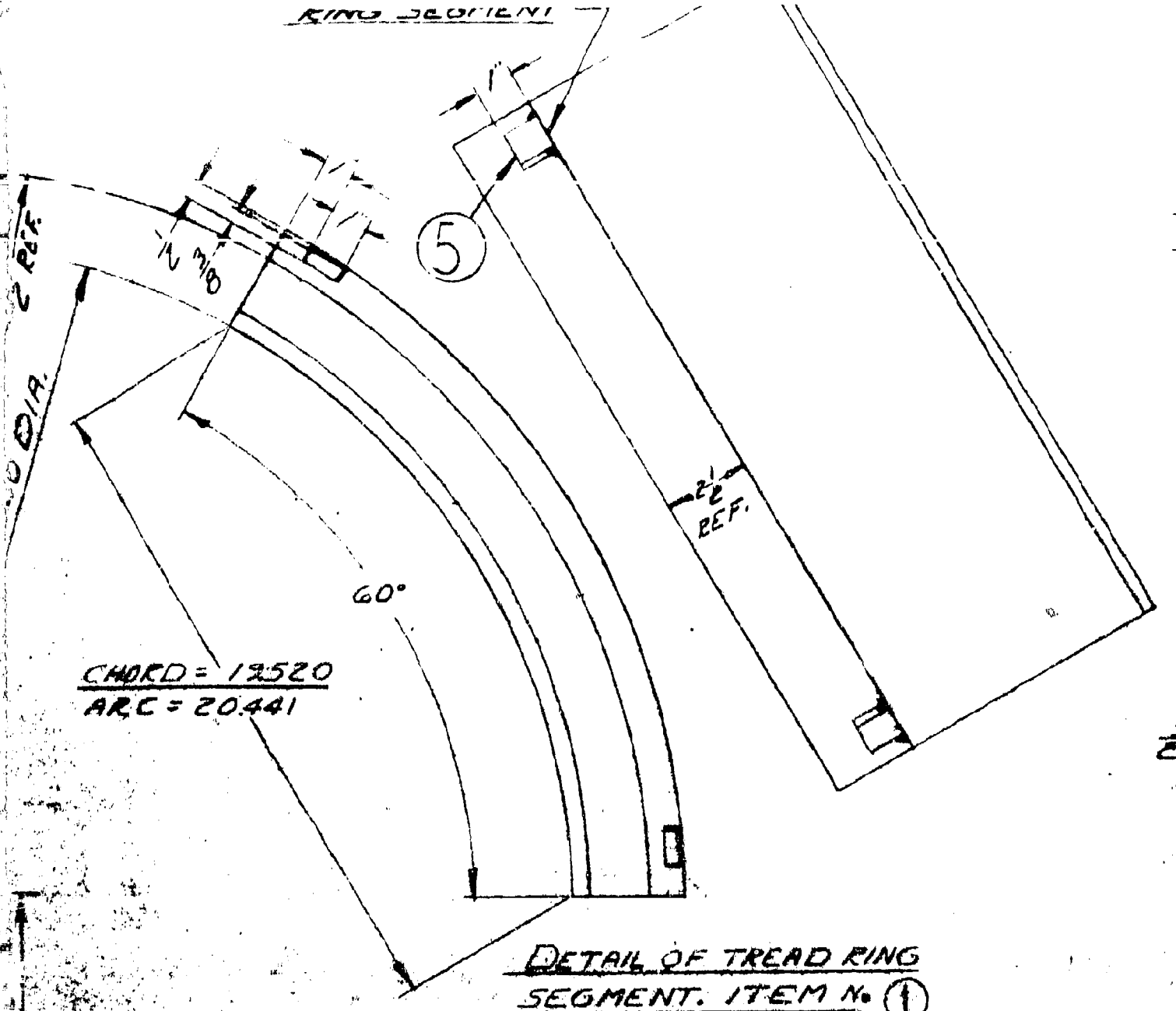
NOTE:
FOR CAVITY DETAILS SEE
PROFILE DWG P-14591-R



ON A-A
SIZE

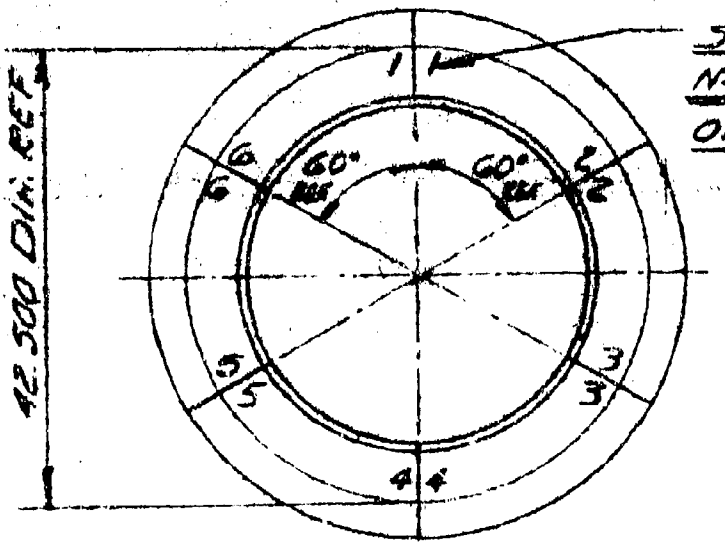
STEEL	12	WELD TO SEGMENTS
EEL PLATE CASTING	1	
EL PLATE	1	
EEL	1	WELD OR CAST ON
EEL PLATE CASTING	6	PATTERN *J-5655

RING SEGMENT



CHORD = 12.520
ARC = 20.441

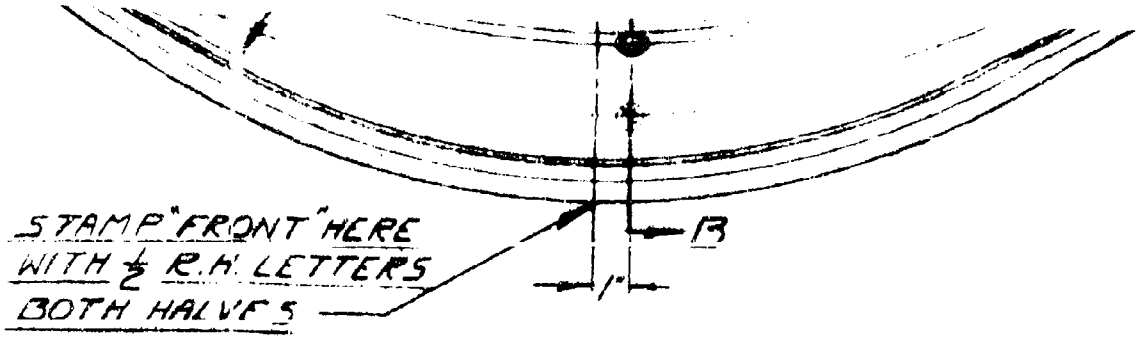
DETAIL OF TREAD RING SEGMENT. ITEM No. (1)



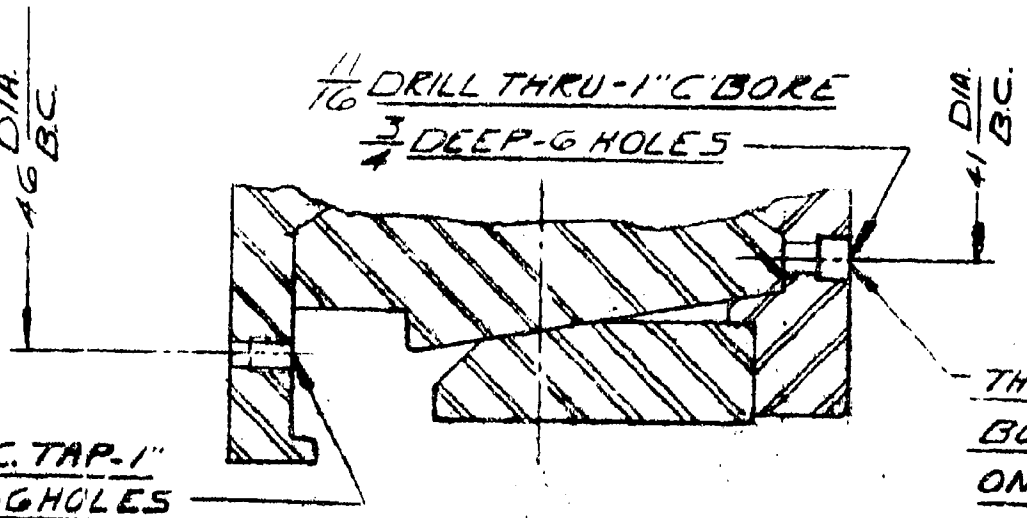
STAMP SEGMENT MATC
No WITH ½ FIGURES
ON TREAD SEGMENTS

PLAN VIEW SHOWING
STAMPING ASSEMBLY

8



PLAN VIEW
3/16 SIZE



SECTION B-B
1/4 SIZE

SEGMENT MATCHING
1/2 FIGURES
10 SEGMENTS.

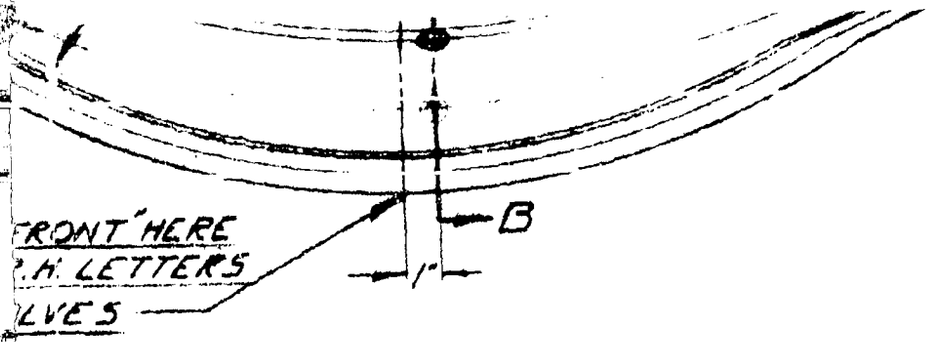
	ADDED NOTE
	46" REF. DIA. PLAN VIEW
REF.	CH

UNITED STATES
CENTRAL
DETROIT

11.00-20 FIN
SEGMENTED
MACHINING D
FOR 55 & 63

9

DRAWN BY | CHECKED BY

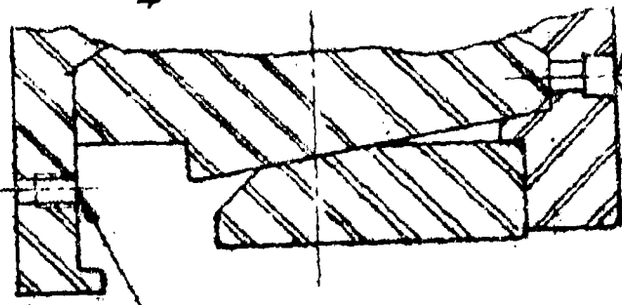


FRONT HERE
H. LETTERS
LVES

PLAN VIEW
3/16 SIZE

11/16 DRILL THRU-1" C'BORE
3/4 DEEP-6 HOLES

41 DIA. B.C.



THESE HOLES USED FOR BOLTING TO RINGS SHOWN ON M-2680-E

TAP-1"
HOLES

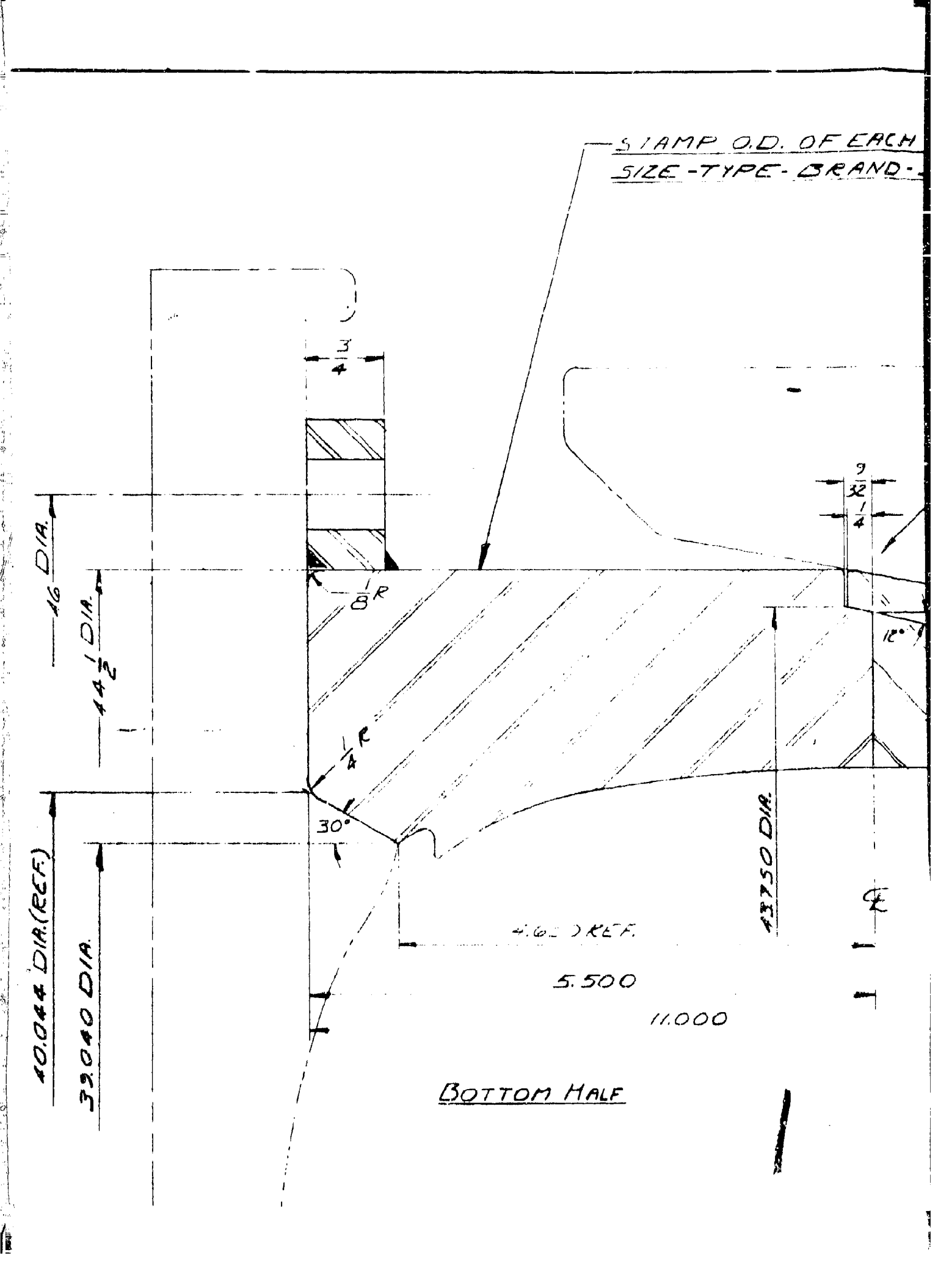
SECTION B-B
1/4 SIZE

REF.	CHANGE	DATE	SIG.
	NODED NOTE TO 41 DIA. B.C. & 46 REF. DIA. B.C. SHOWN IN PLAN VIEW WAS 45¾ (2 PLACES)	9-8-64	1

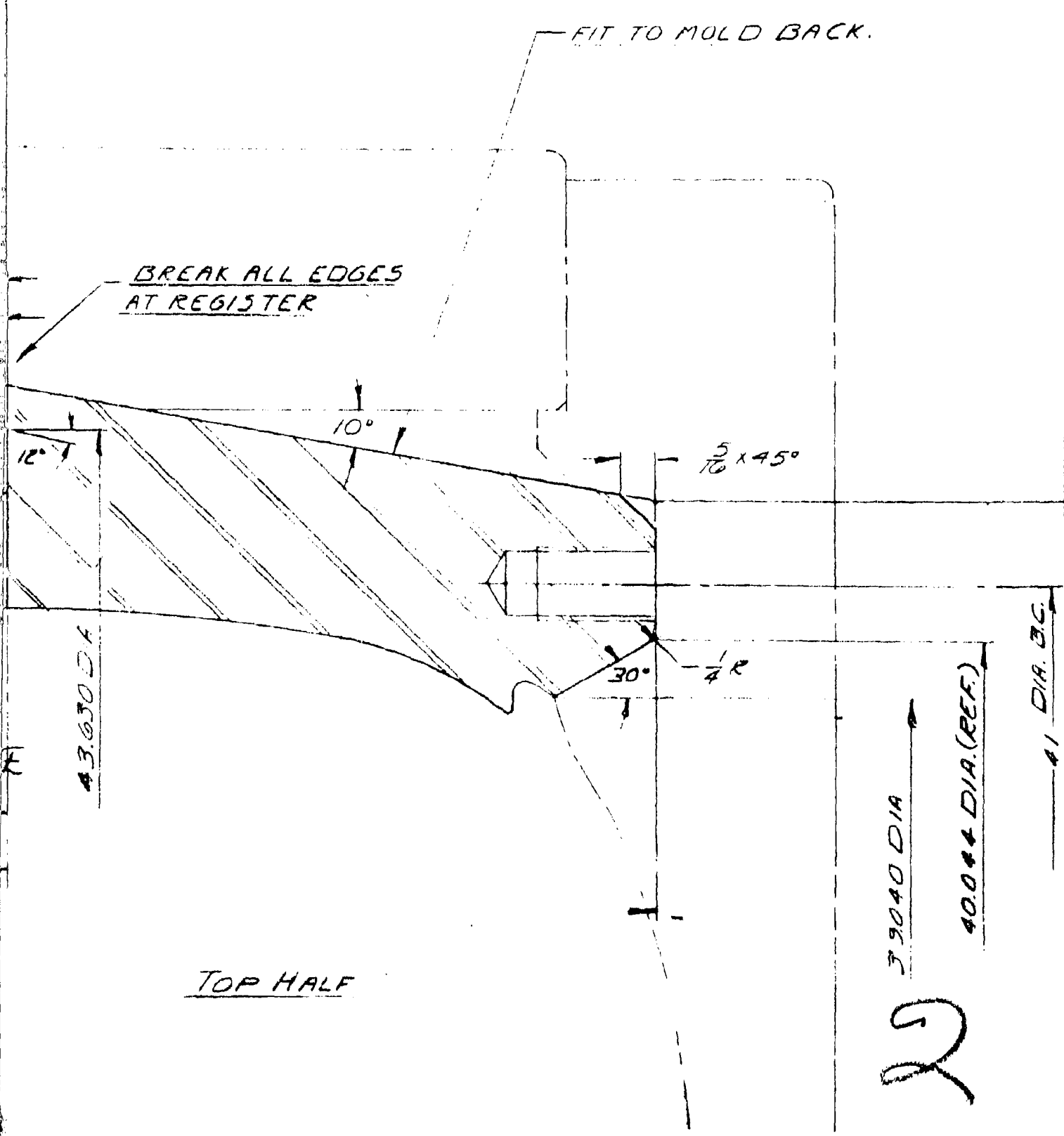
UNITED STATES RUBBER COMPANY
CENTRAL SCALE DIVISION
DETROIT - - MICHIGAN

11.00-20 FINAL MOLD
SEGMENTED TREAD
MACHINING DWG.
FOR 55 & 65 McNEIL

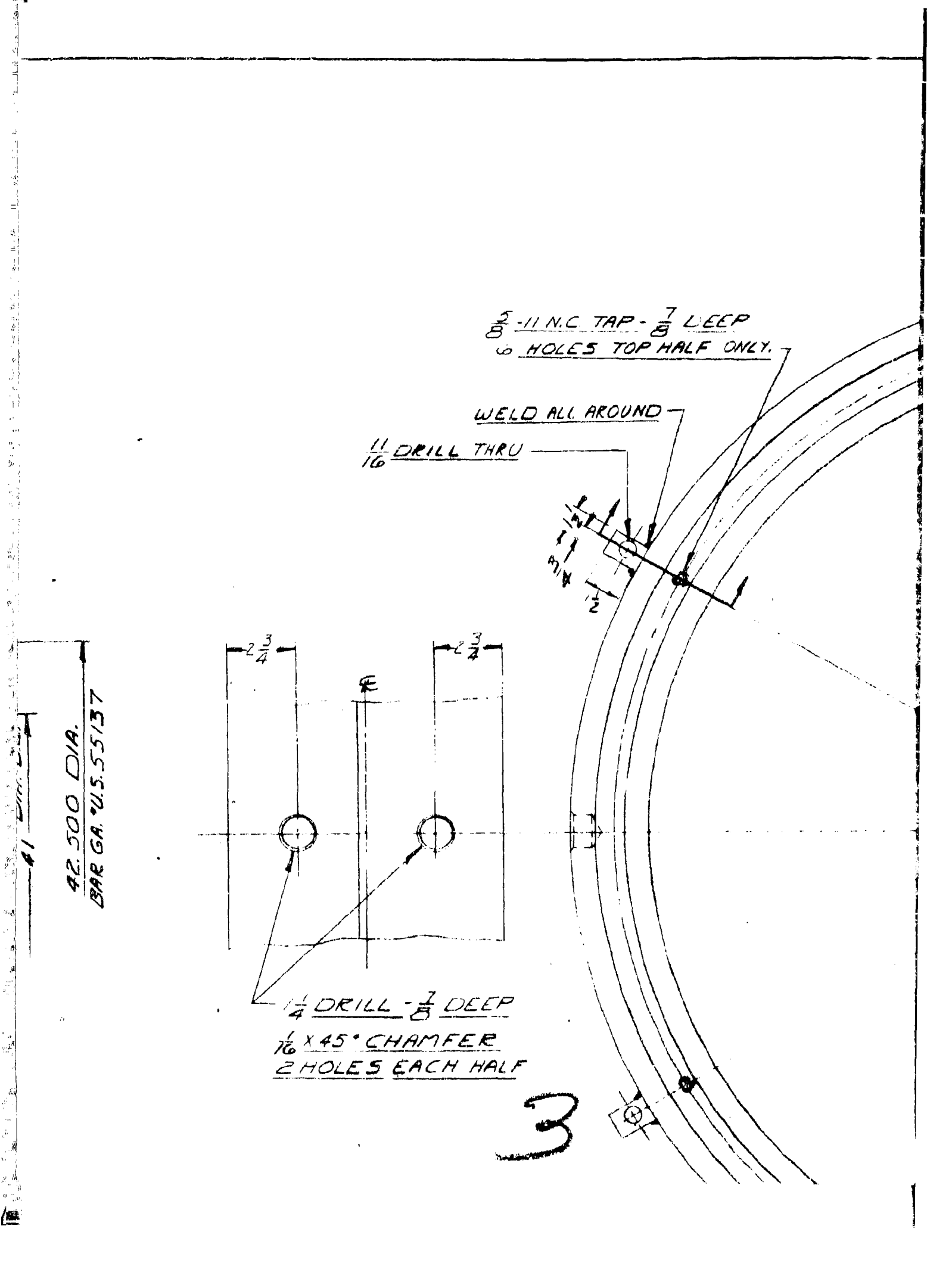
10

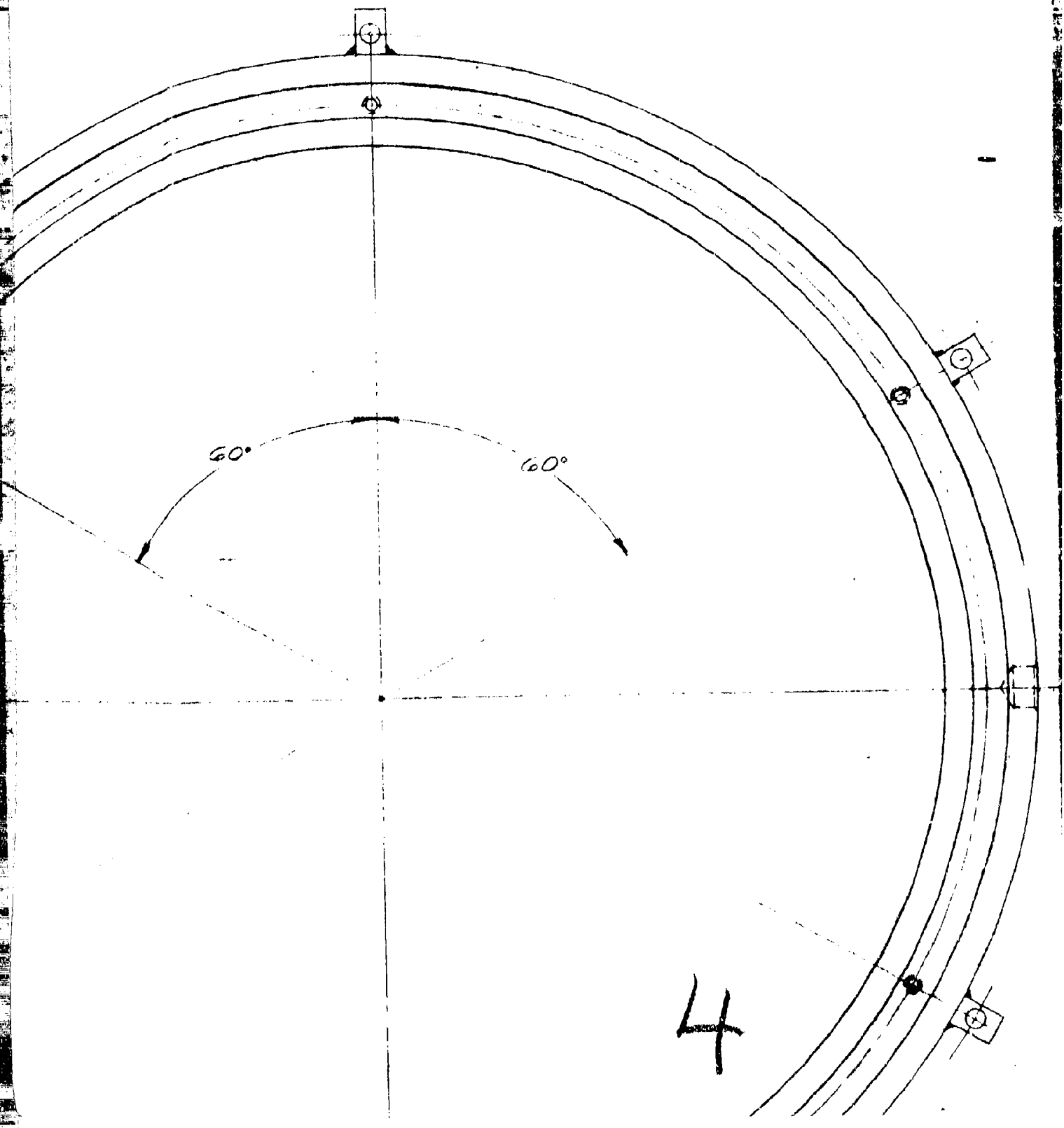

STAMP O.D. OF EACH
SIZE - TYPE - BRAND -
3/4
9/32
1/4
1/8 R
16 DIA.
14 1/2 DIA.
1/4 R
30°
12°
40.044 DIA. (REF.)
39.040 DIA.
43750 DIA.
4.6_ REF.
5.500
11.000
BOTTOM HALF

ACH RING THUS IN 2 PLACES.
ND - SER. N° - PLY

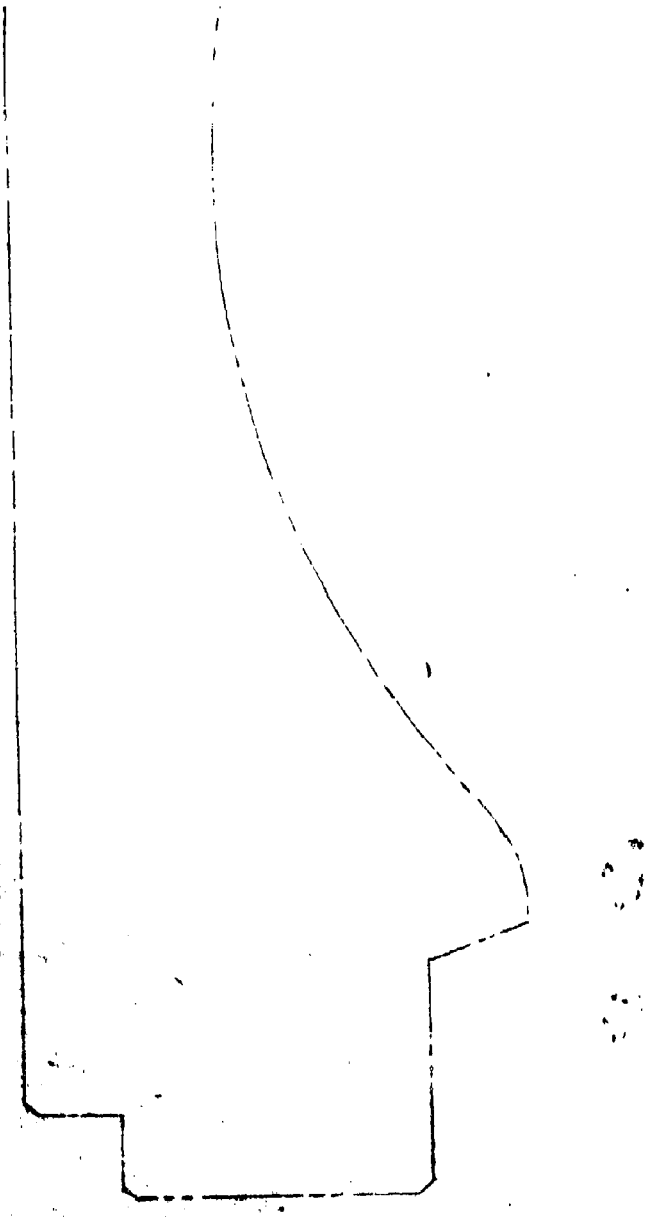


TOP HALF


5/8 -11 N.C TAP - 7/8 DEEP
6 HOLES TOP HALF ONLY.
WELD ALL AROUND
11/16 DRILL THRU
1 1/4
1 3/4
1/2
2 3/4
2 3/4
41 DIA.
42.500 DIA.
BAR GA. "U.S. 55/137
1/4 DRILL - 7/8 DEEP
1/16 X 45° CHAMFER
2 HOLES EACH HALF
3

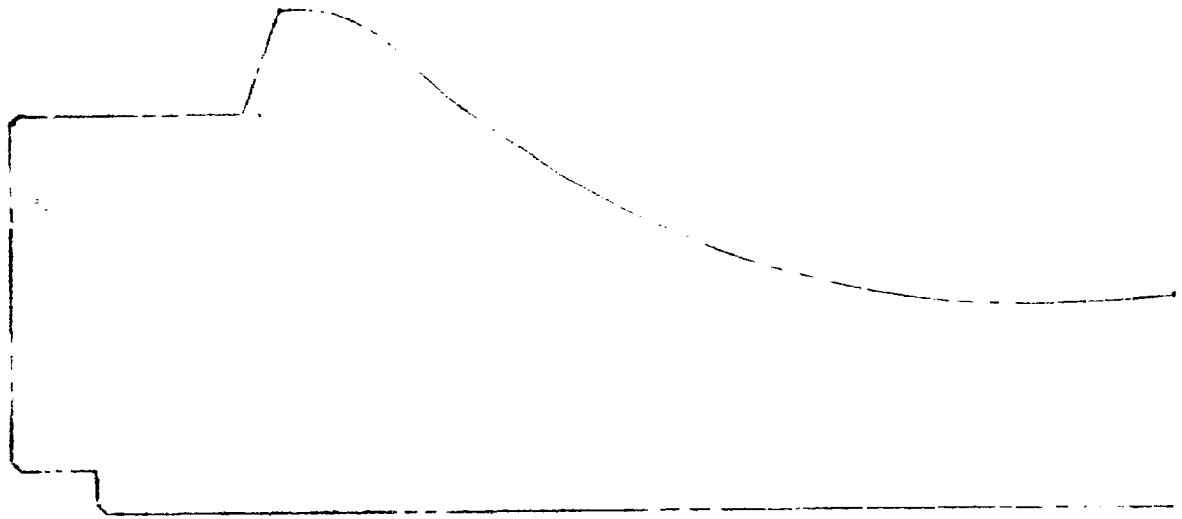


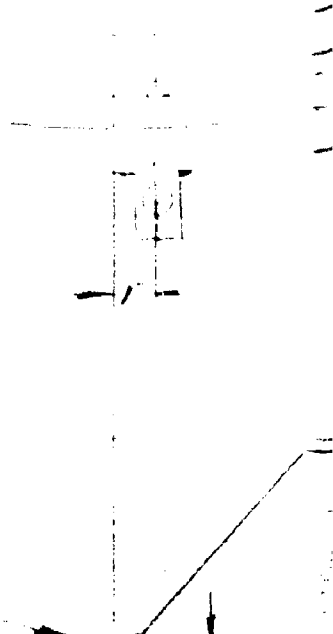
4

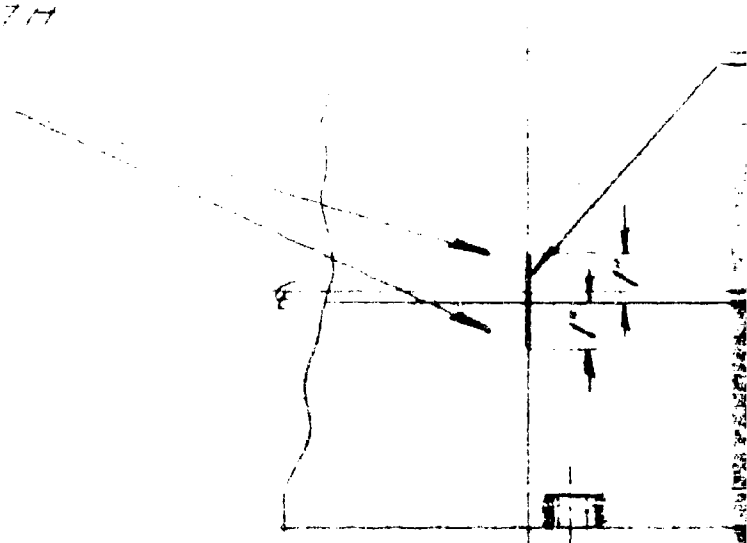


FOR CAVITY DETAILS SEE
PROFILE DWG PER ORDER.

5

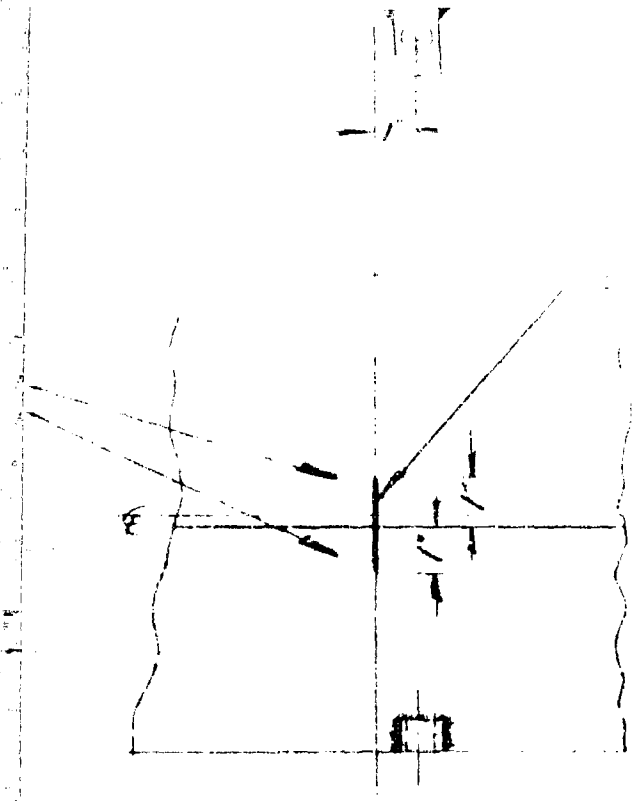






MATERIAL : STEEL PLATE

7



" WIDE LINE - $\frac{1}{32}$ DEEP
(FOR MATCH UP PURPOSES)

REF.	CHANGE	DATE	SUB

UNITED STATES RUBBER COMPANY
CENTRAL MOLD DIVISION
DETROIT - - MICHIGAN

11.00-20 TREAD RINGS (CARCASS)

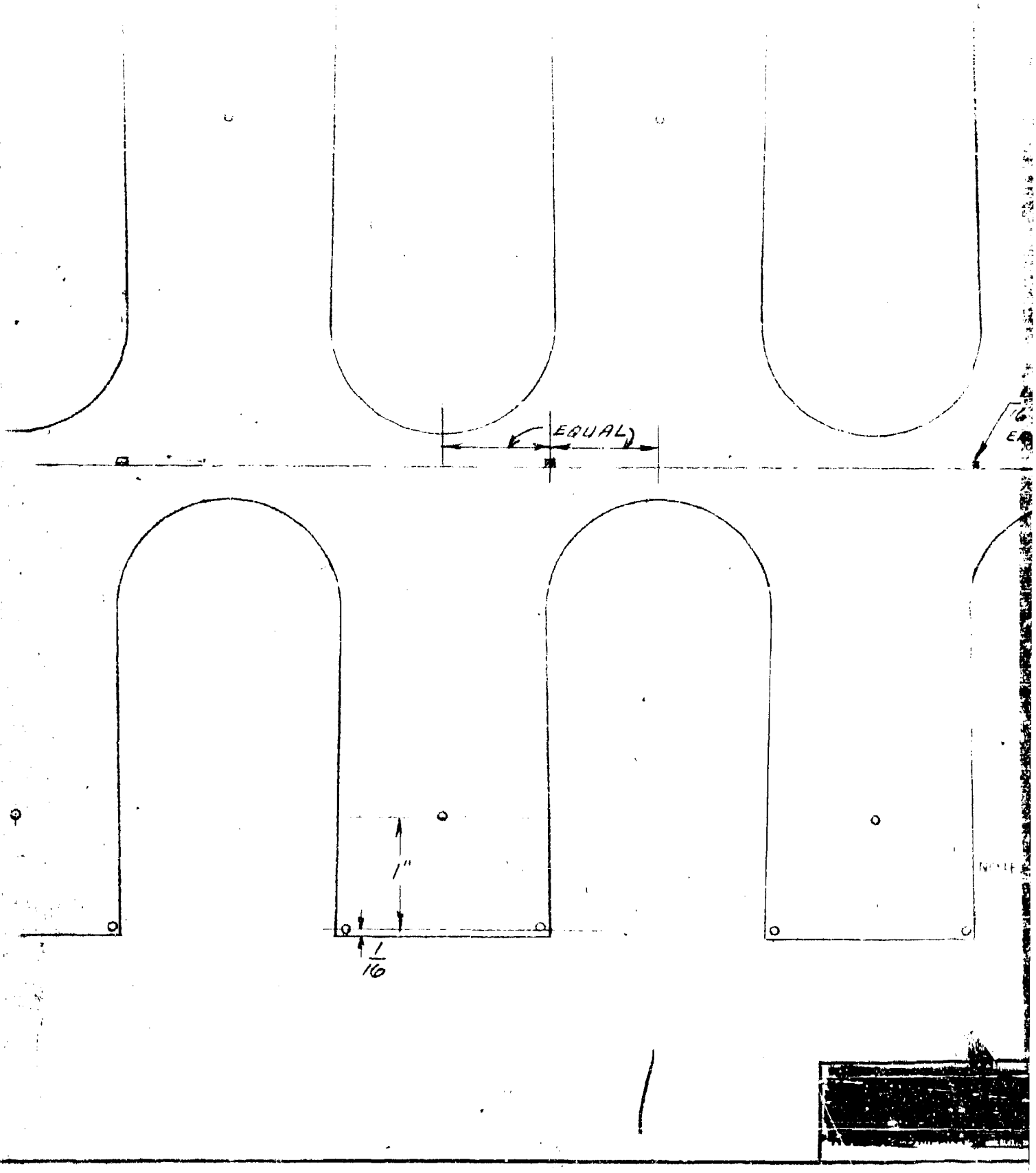
FOR USE IN M-2679-R
(55" & 65" McNEIL ONLY)

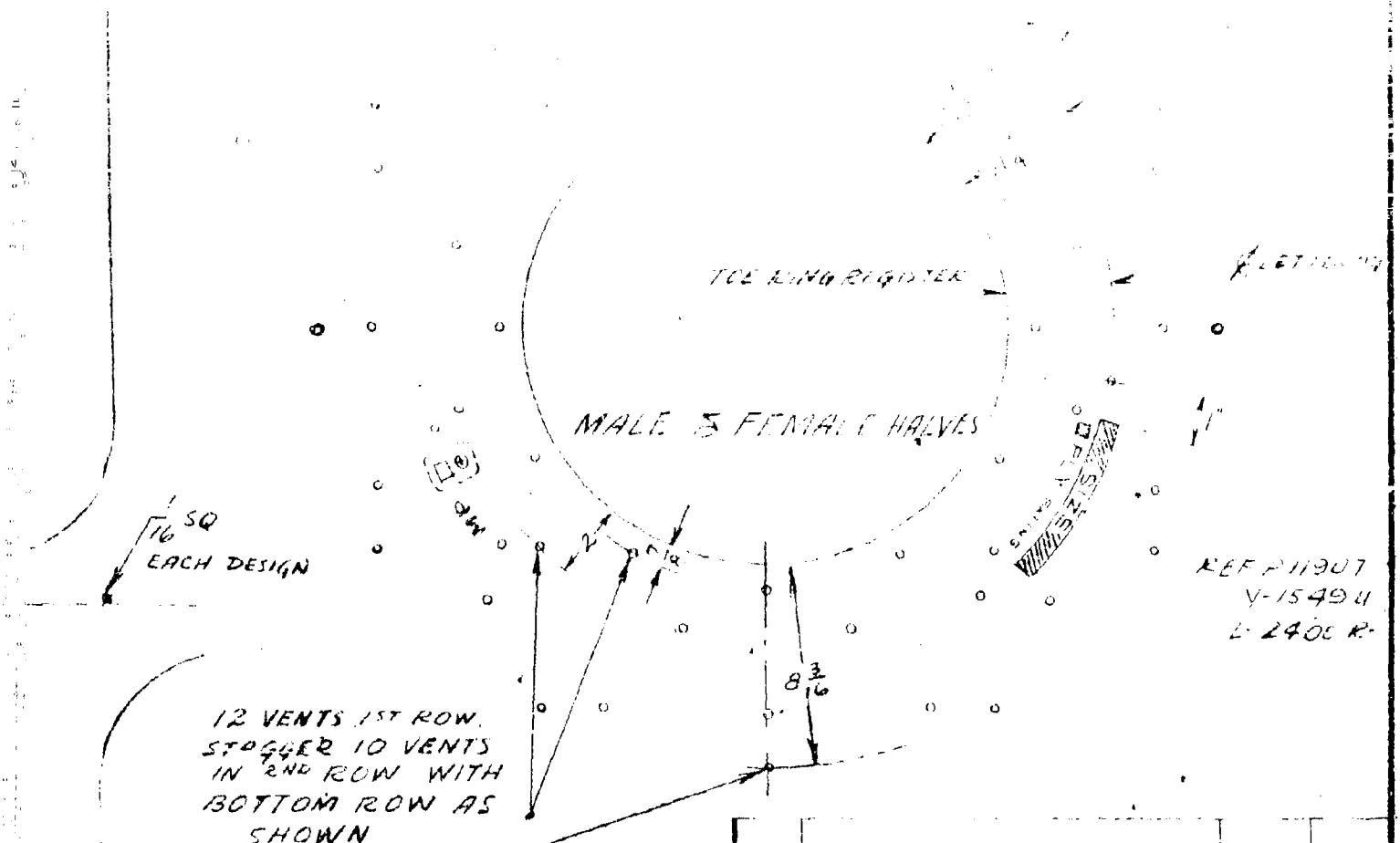
7 8

NOTICE

Construction and method of manufacturing this tire may be covered by one or more of the following patents: 2,637,362 2,781,815 2,782,830 2,786,507 2,789,616 and other Patents Pending

DRAWN BY	CHECKED BY	SUPERSEDES	M-2680
DATE STARTED	DATE FINISHED	SUPERSEDED BY	R
APPROVED BY	REFERENCE F-1699-R	MOLD DWG.	


EQUAL
1"
1/16



REF.	CHANGE	DATE	SUB.

UNITED STATES RUBBER COMPANY
DETROIT 32, MICHIGAN

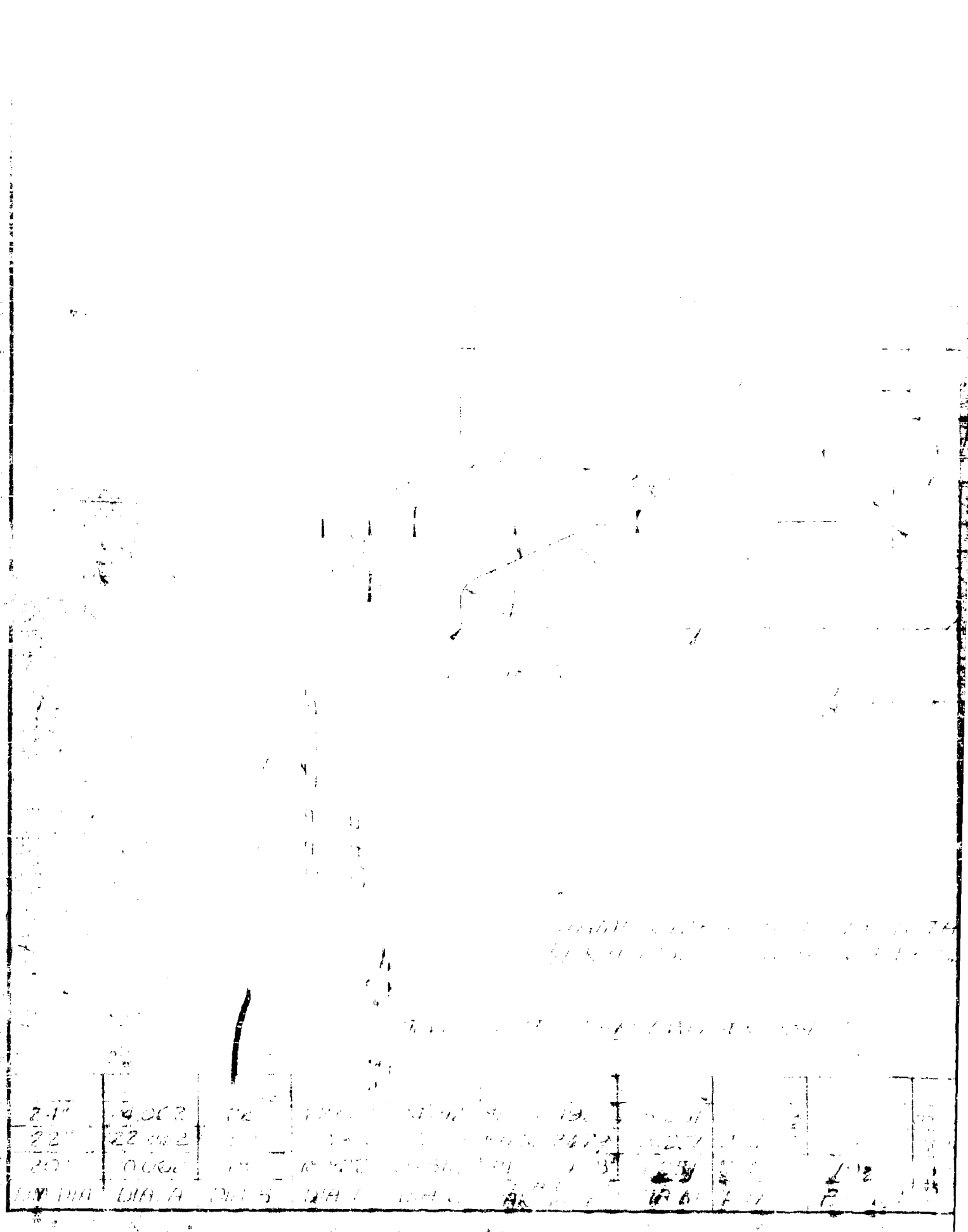
VENTING FOR:

U. S. ROYAL TACTICAL
EXPERIMENTAL

NOTE: OMIT ALL VENTS WHICH FALL INTO LETTERING.
SPECIFICATIONS FOR DRILLED VENTS:
No. 50 (.070) ± .010 DIA. DRILL - BREAK SHARP EDGE ON CAVITY SIDE WITH 1/64 x 45° CHAMFER.
TREAD VENTS MUST BE RADIAL ± 10°.
ALL SIDEWALL VENTS MUST BE PERPENDICULAR TO PARTING LINE OF MOLD.
STANDARD VENT PATTERN - ANY PORTION MAY BE ELIMINATED AT LOCAL PLANT DISCRETION.

2

PRODUCT DEVELOPMENT DIVISION		MOLD DIVISION		SCALE -
DRAWN BY	DATE	DRAWN BY	SUPERVISOR	V-1583
CHECKED	8-28-59	CHECKED	SUPERINTENDENT	
APPROVED	8-28-59	APPROVED	MOLD DWG.	U-
REFERENCE	STYLE DWG. (1515)			



PLAN VIEW
1/4 SIZE

REF.	CHANGE	DATE	SUB
		1-6-58	d
		11-9-56	c
		1-17-56	b
			a

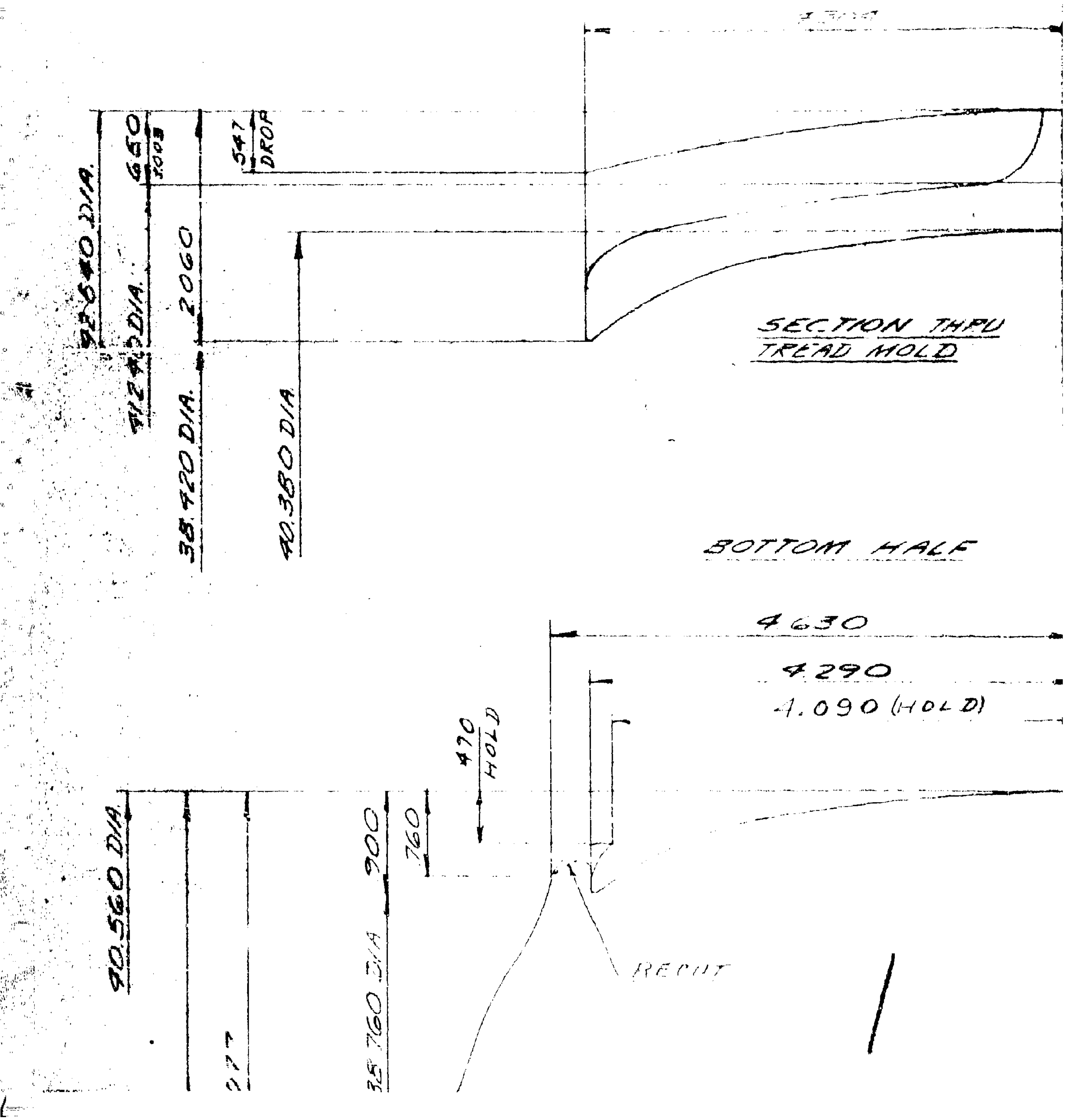
UNITED STATES RUBBER COMPANY
DETROIT PLANT
DETROIT - - MICHIGAN

TOE RING

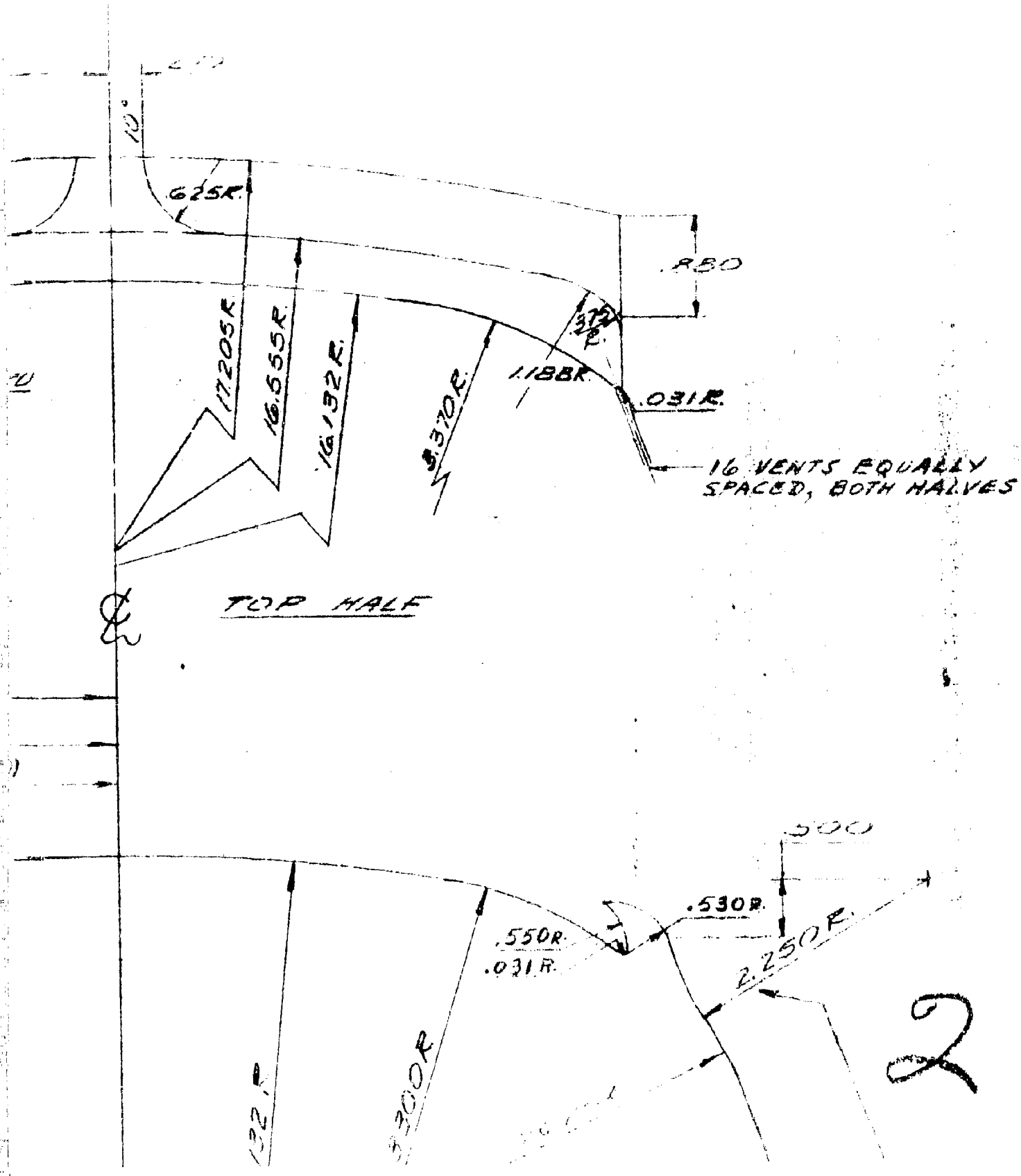
Bottom Ring

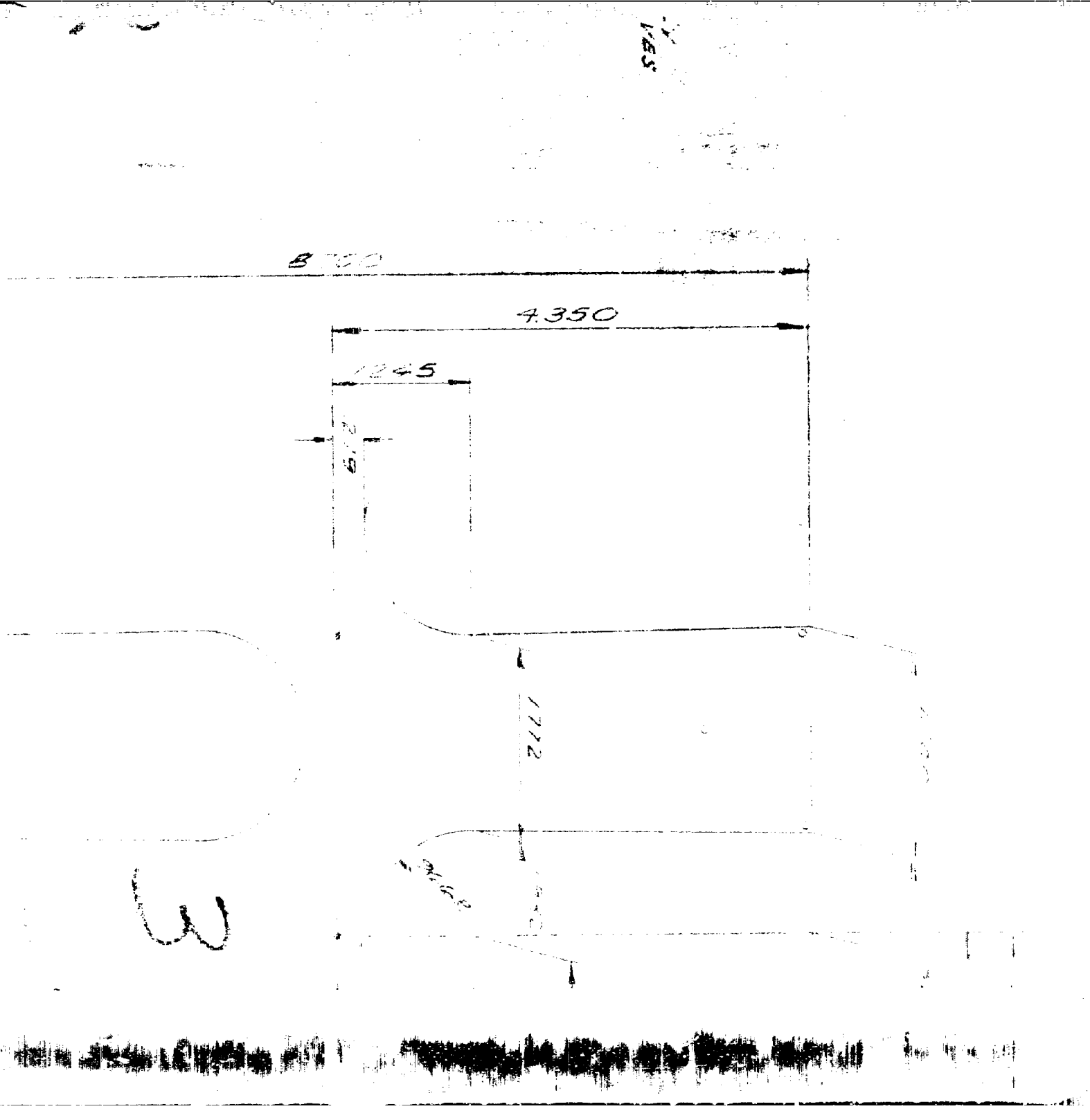
Bottom Ring

DRAWN BY	CHECKED BY	SUPERSEDES	T-779
APPROVED BY	REFERENCE	SUPERSEDED BY	



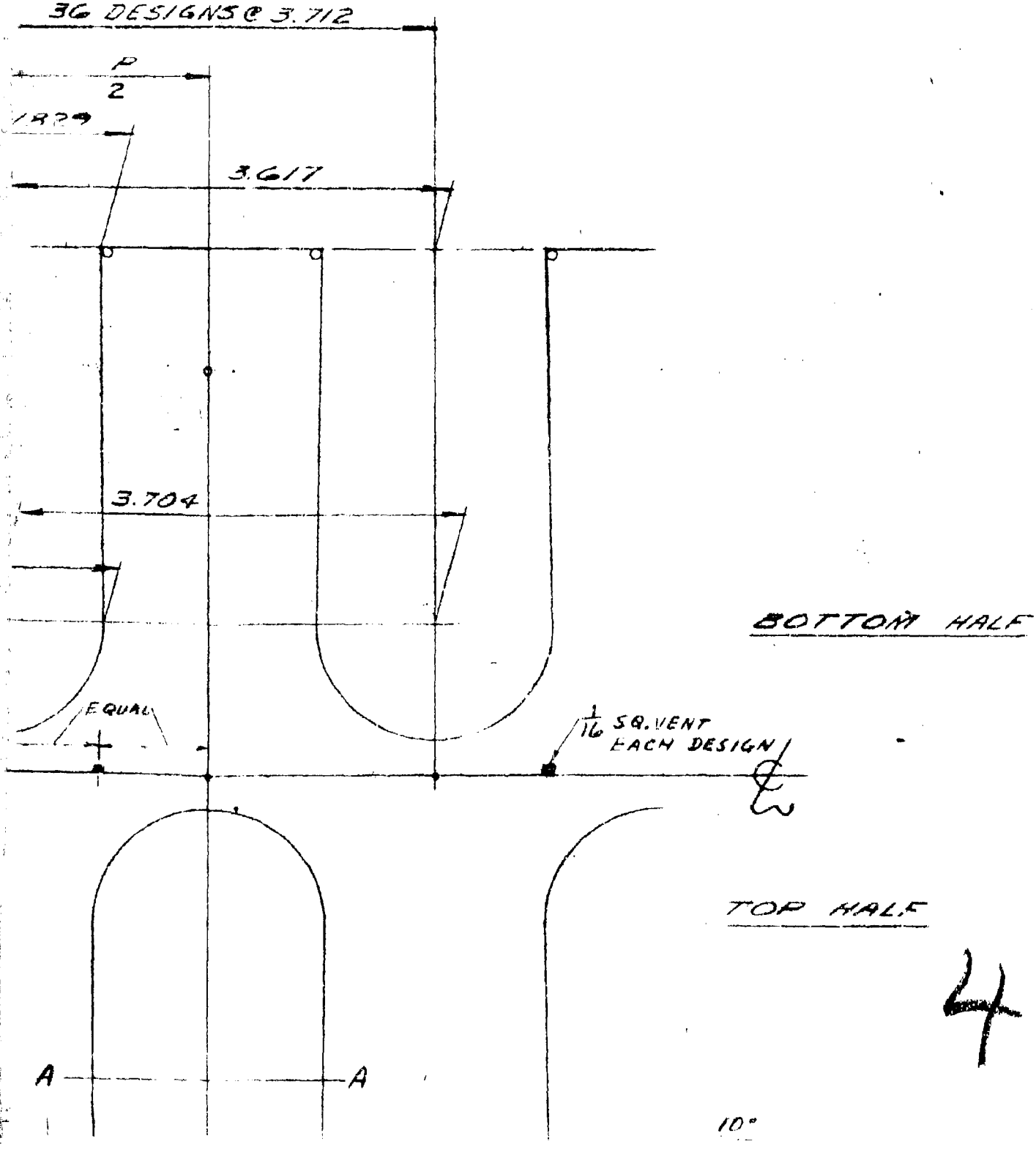
SECTION THRU
TREAD MOLD
BOTTOM HALF
41.640 DIA.
41.245 DIA.
660
547
DROP
2060
38.420 DIA.
40.380 DIA.
4630
4290
4.090 (HOLD)
470
HOLD
40.560 DIA.
900
760
38.760 DIA


10°
.625R.
.117205R.
16.555R.
16.132R.
3.370R.
1.188R.
.031R.
.250R.
.375R.
16 VENTS EQUALLY SPACED, BOTH HALVES
TOP HALF
.530R.
.550R.
.031R.
2.250R.
.300R.
132R.
2

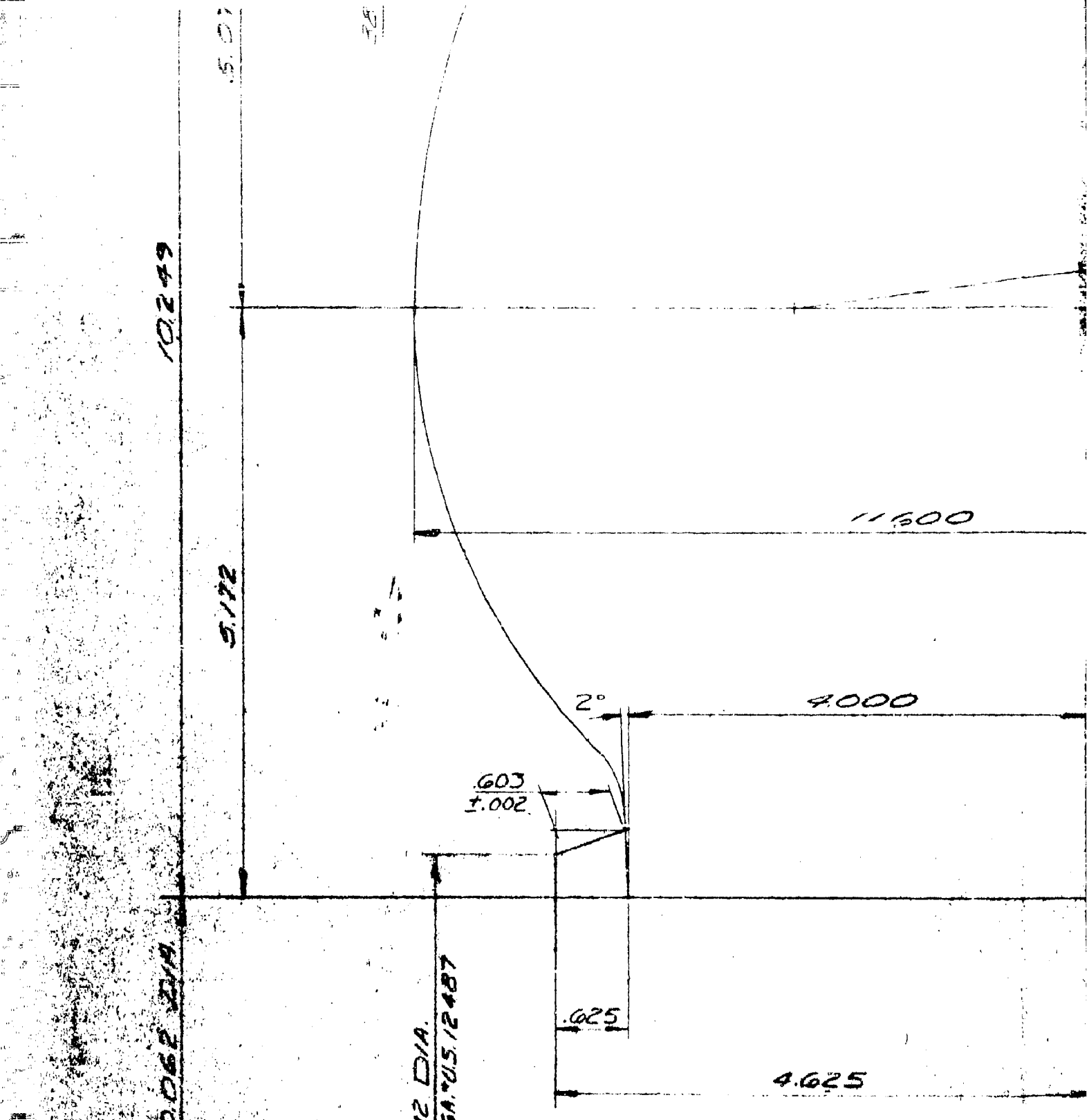

8 700
4350
1245
1772

THE TIRE

[illegible] DEVELOPED LENGTHS



4

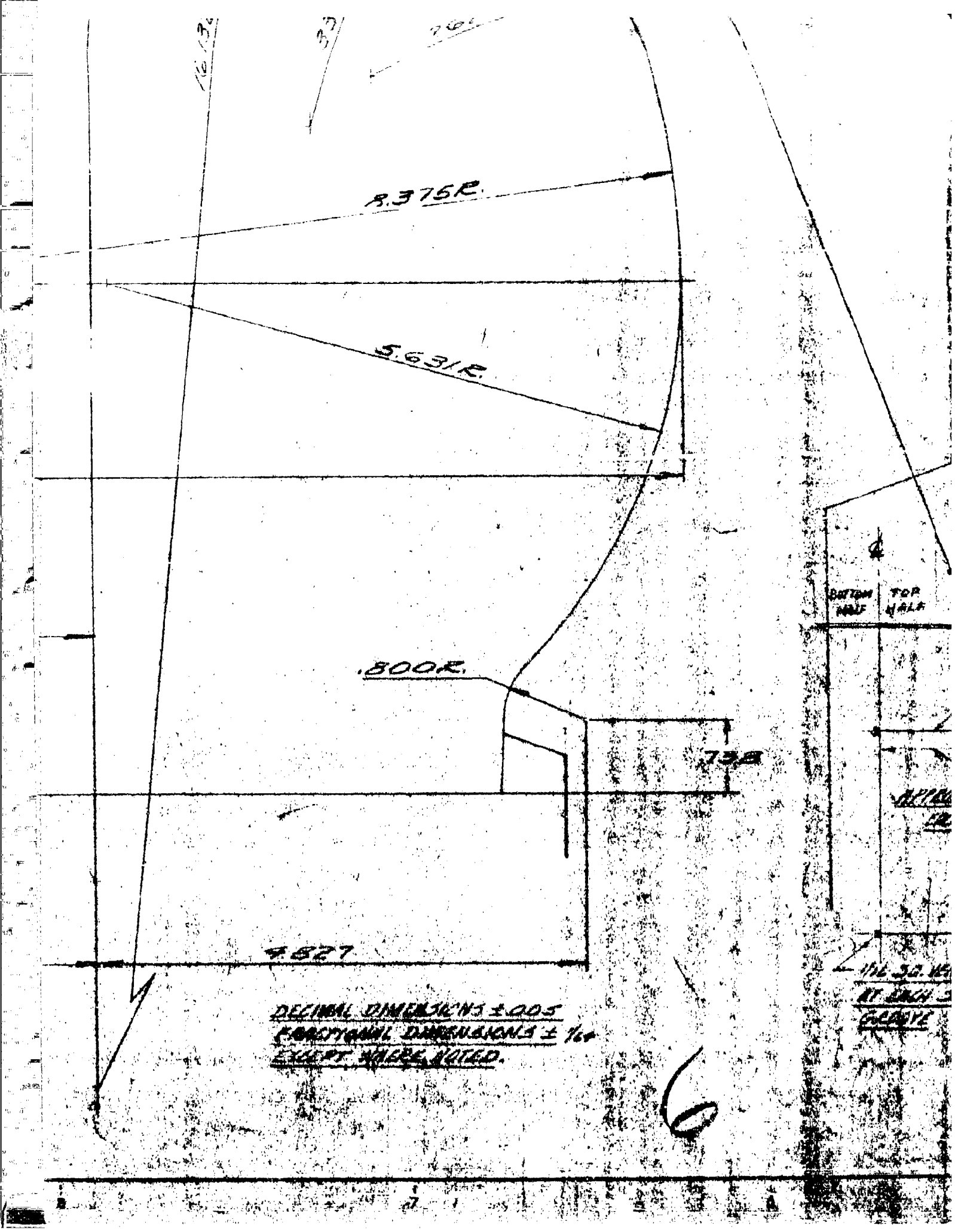


SECTION THRU
CARCASS MOLD

TEMPLETS: (CARCASS MOLD)
" U.S. 55139 CAVITY SHAPE
" 55139 CORRUGATION

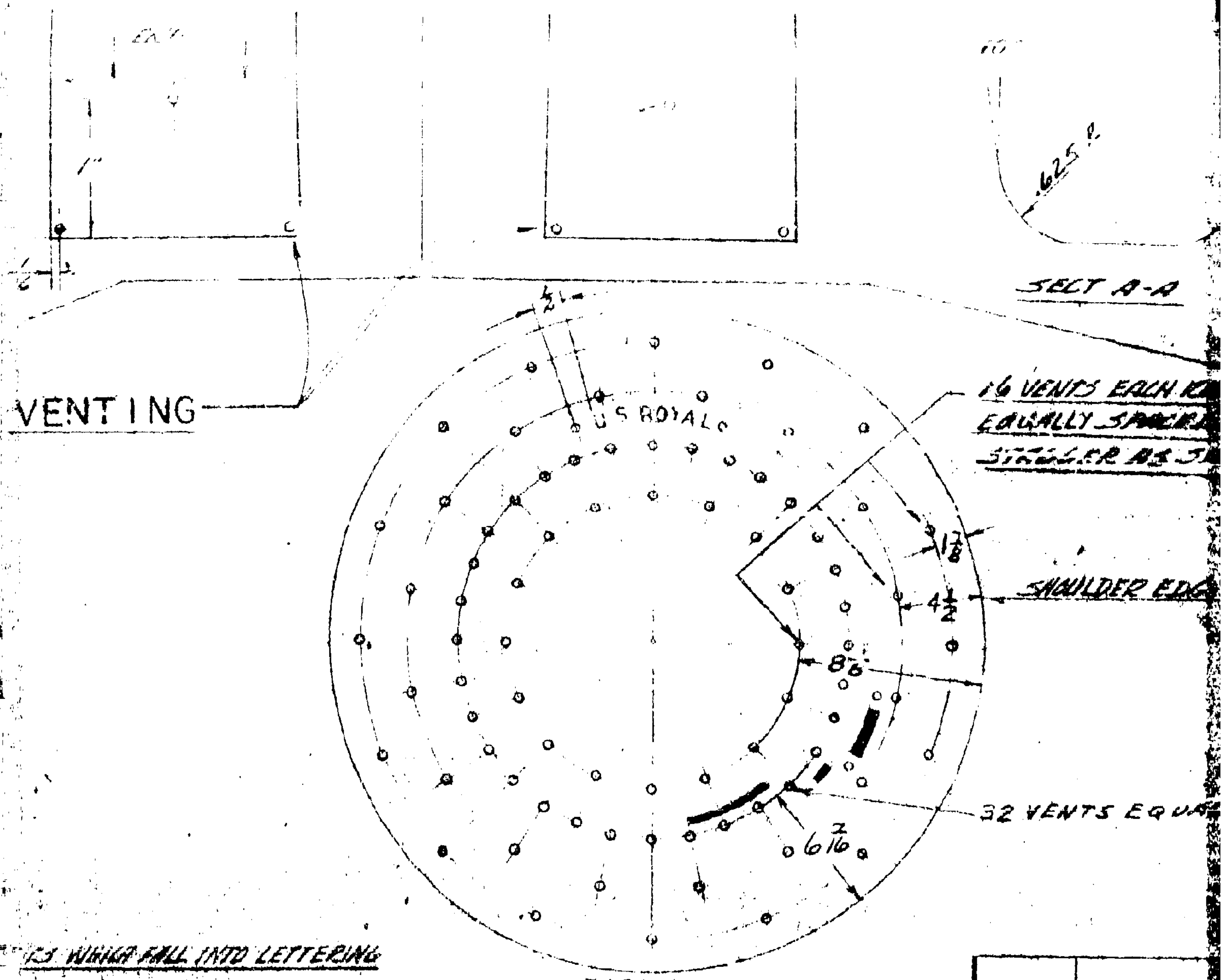
TEMPLETS: (TREAD MOLD)
U.S. 55140 CAVITY SHAPE
" 55141 TREAD CORRUGATION.
" 55142 TREAD DESIGN.

5


.375R.
5.631R.
.800R.
.73R
.827
DECIMAL DIMENSIONS ±.005
FRACTIONAL DIMENSIONS ± 1/64
EXCEPT WHERE NOTED.
6
BOTTOM HALF
TOP HALF

OMIT ALL VENTS WHICH FALL INTO LETTER
SPECIFICATIONS FOR DRILLED VENTS.
№ 58 (.070) ± .010 DIA. DRILL-EDGE
EDGE ON CAVITY SIDE WITH 1/32 ± .010 X
CHAMFER.
TREAD VENTS MUST BE RADIAL ±10
SIDEWALL VENTS MUST BE 90° TO
PARTING LINE OF MOLD.
STAGGERED VENT PATTERN - MAY POS
BE ELIMINATED AT LOCAL PLANT OPT

7



…ES WHICH FALL INTO LETTERING
…WS FOR DRILLED VENTS.
…) ± .010 DIA. DRILL-BREAK SHARP
…ITY SIDE WITH 1/64 ±.010 X45°

…ES MUST BE RADIAL +10° - 0°
VENTS MUST BE 90° TO
…NE OF MOLD.
VENT PATTERN - ANY PORTION MAY
…TED AT LOCAL PLANT OPTION.

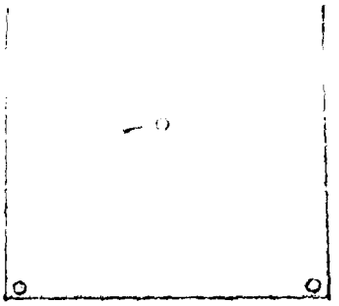
8

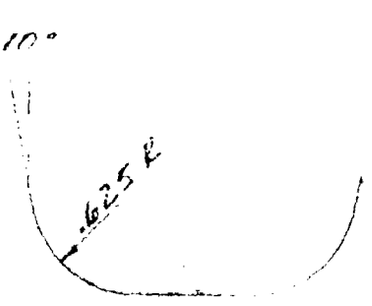
D. P. =	
T. W. =	% OF
T. R. =	% OF
D. H. / C. S.	= =
RIM FIT = 7.5 ADV. (TIGHT)	
N/G =	
TOE RING NO. T-779	
VENTING INCLUDED (LETTERING REF: L-3206-R)	
MODEL NO.	
MOLD DWG. NO. M-2679-R M-2680-R & M-2681-R	

REMCHEAT 5B203	ADD RECE… EDGE (… ADDED:- MOLD NO'S. …

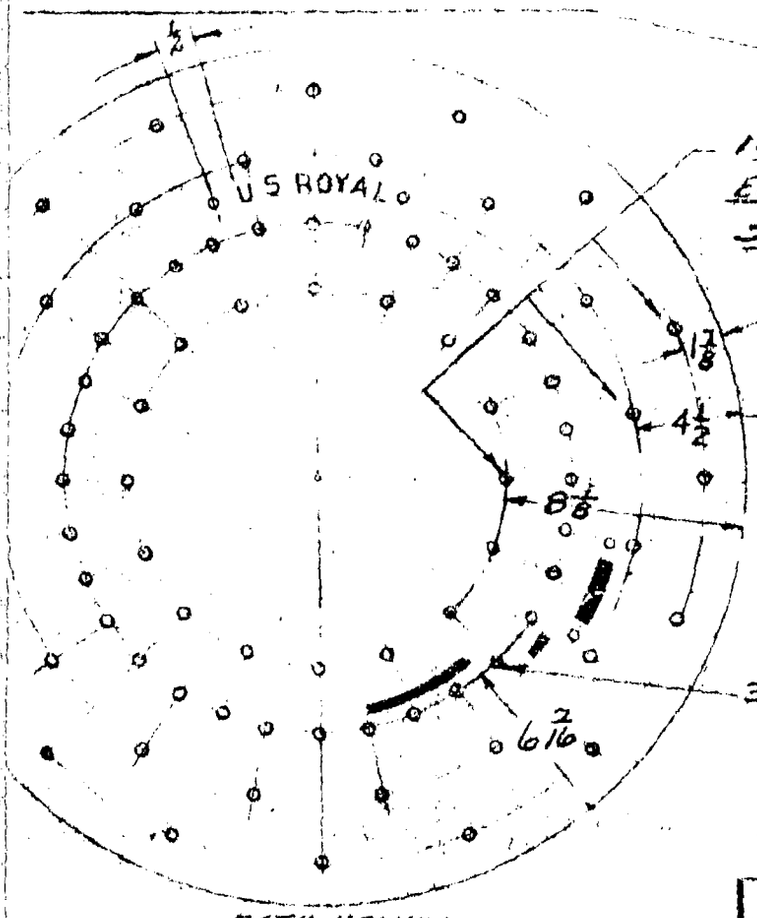
UNITED STAT…
DETRO…
1100-20 U.S. R…
PH…
DETACHABLE …

PRODUCT DEVELOPMENT DIVISION
DRAWN BY | DATE





SECT A-A



16 VENTS EACH ROW EQUALLY SPACED. STAGGER AS SHOWN.

SHOULDER EDGE

32 VENTS EQUALLY SPACED

BOTH HALVES

9

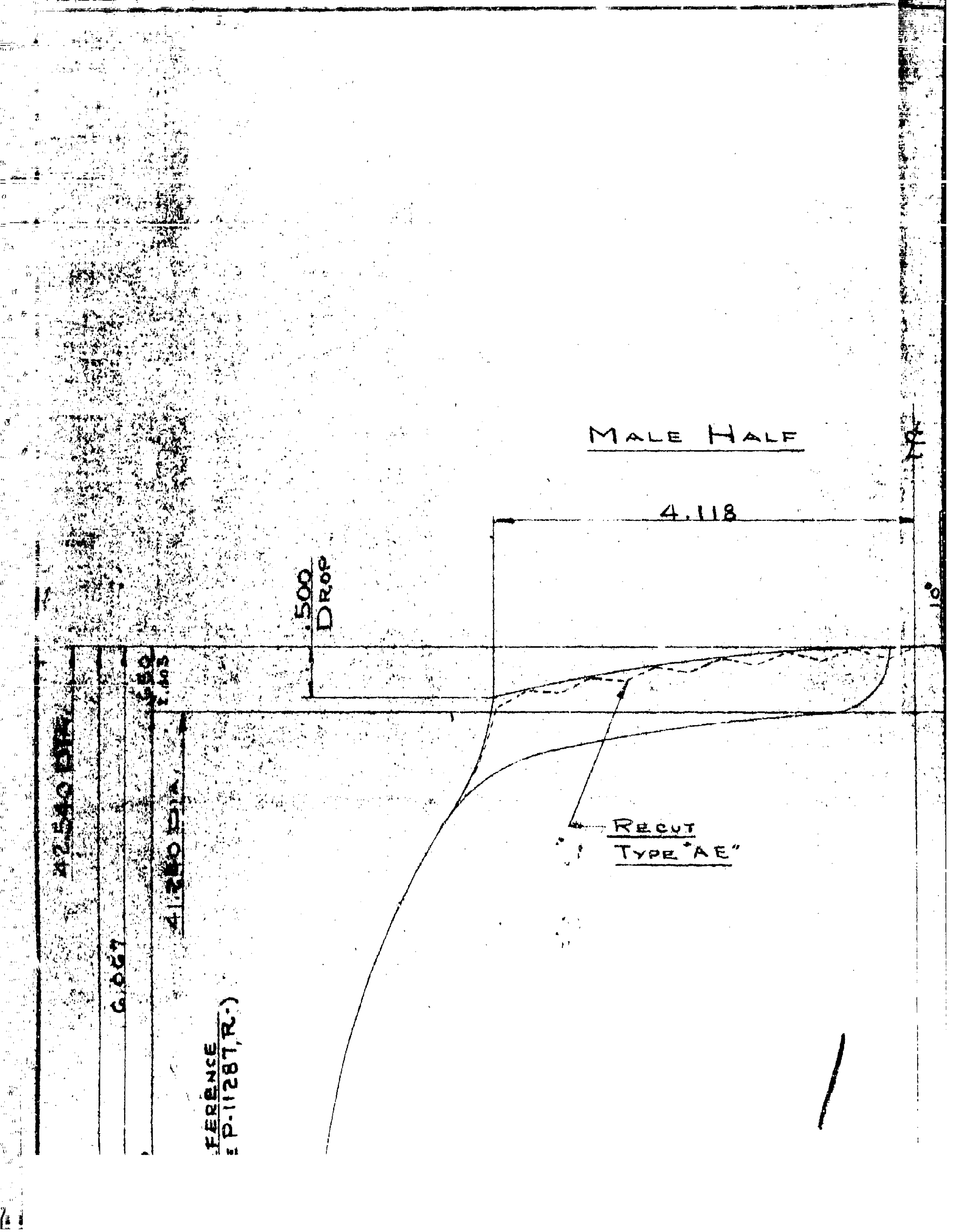
REF.	CHANGE	DATE	SHT.
REVISED SB203	ADD RECUT OF SHOULDER EDGE (J, H). PHASE NO. WAS III	1-14-66	2
	ADDED: RING SEAT I DIM'S., MOLD NO'S. AND TEMPLETS	6-7-66	1

D. P. =
T. W. = % OF
T. R. = % OF
D. H. =
C. S. =
RIM FIT = 7.5 ADV. (TIGHT)
N/G =
TOE RING NO. T-779
VENTING INCLUDED
(LETTERING REF: L-3206 R)
MODEL NO.
MOLD DWG. NO. M-2679-R, M-2680-R & M-2681-R

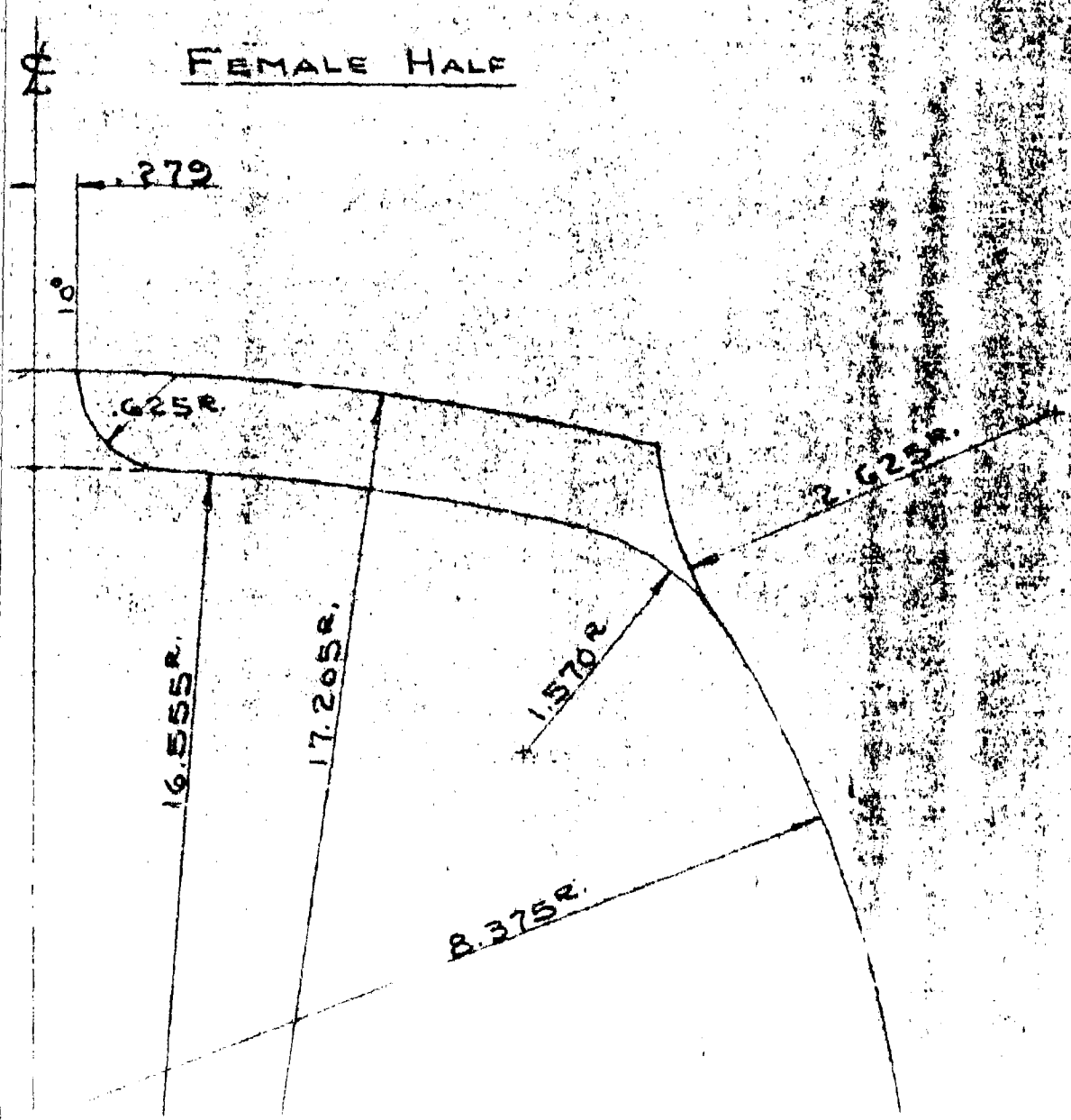
UNITED STATES RUBBER COMPANY
DETROIT — MICHIGAN

11.00-20 U.S. ROYAL (TACTICAL)
PHASE II
DETACHABLE TREAD & CARCASS
TYPE "G"

PRODUCT DEVELOPMENT DIVISION | MOLD DIVISION | SCALE FULL
DRAWN BY | DATE 1-24-63 | DRAWN BY | DIAGRAM


MALE HALF
4.118
.500 DROP
RECUT
TYPE "AE"

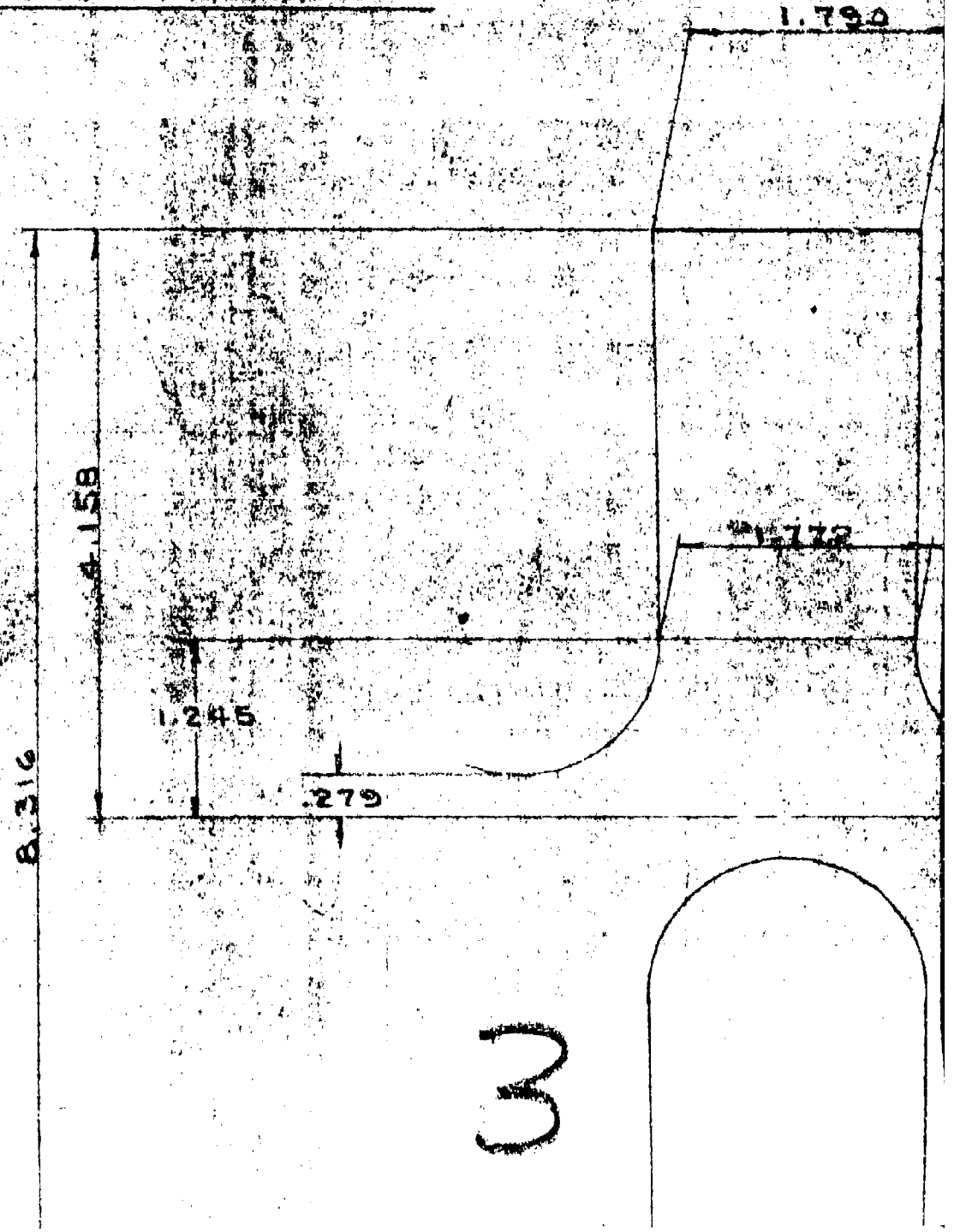
VENT



...ING. DWG. NO. V-1583,U

TREAD VIEW OF TIRE

DIMENSIONS SHOWN ARE DEVELOPED LENGTHS



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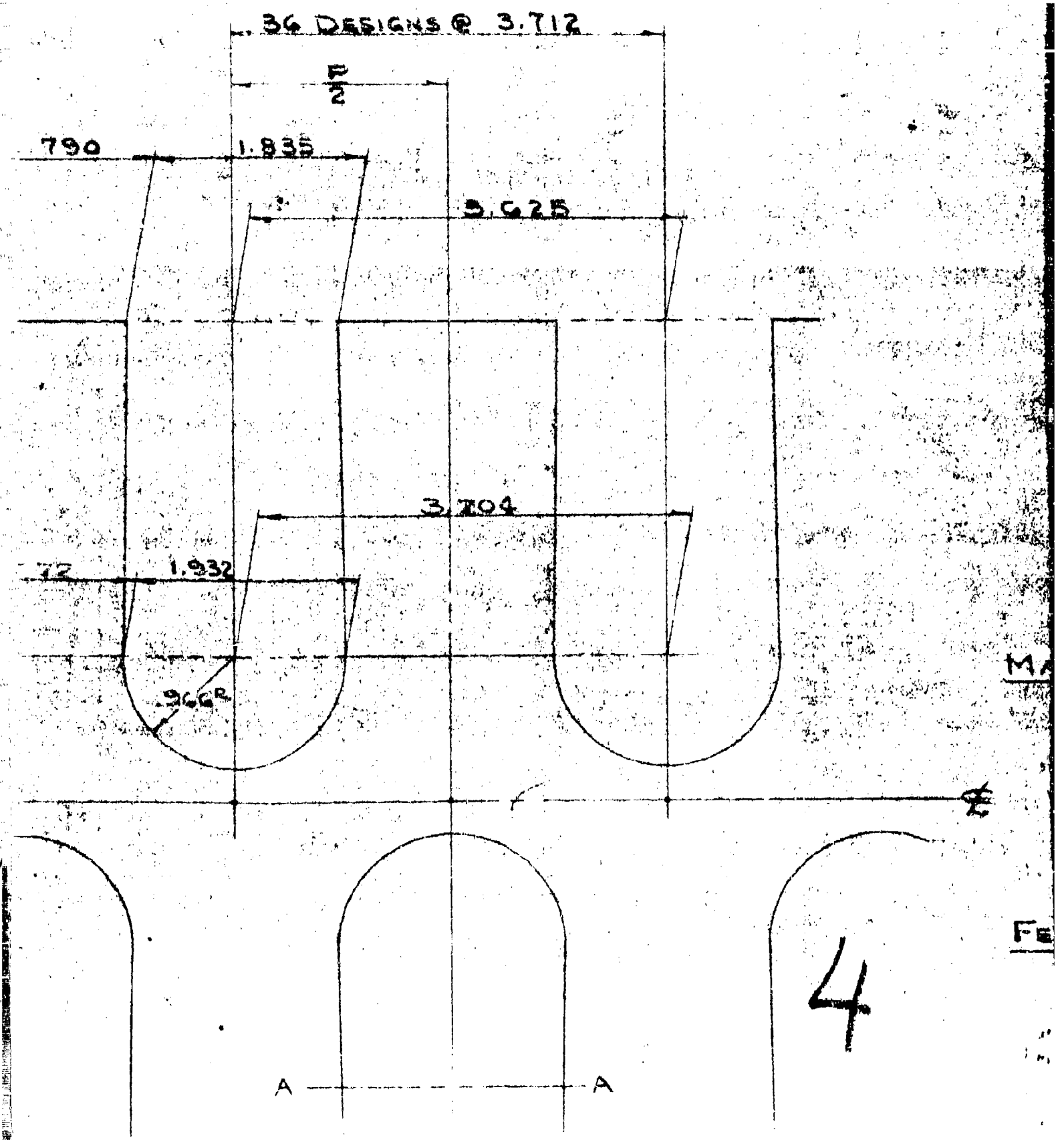
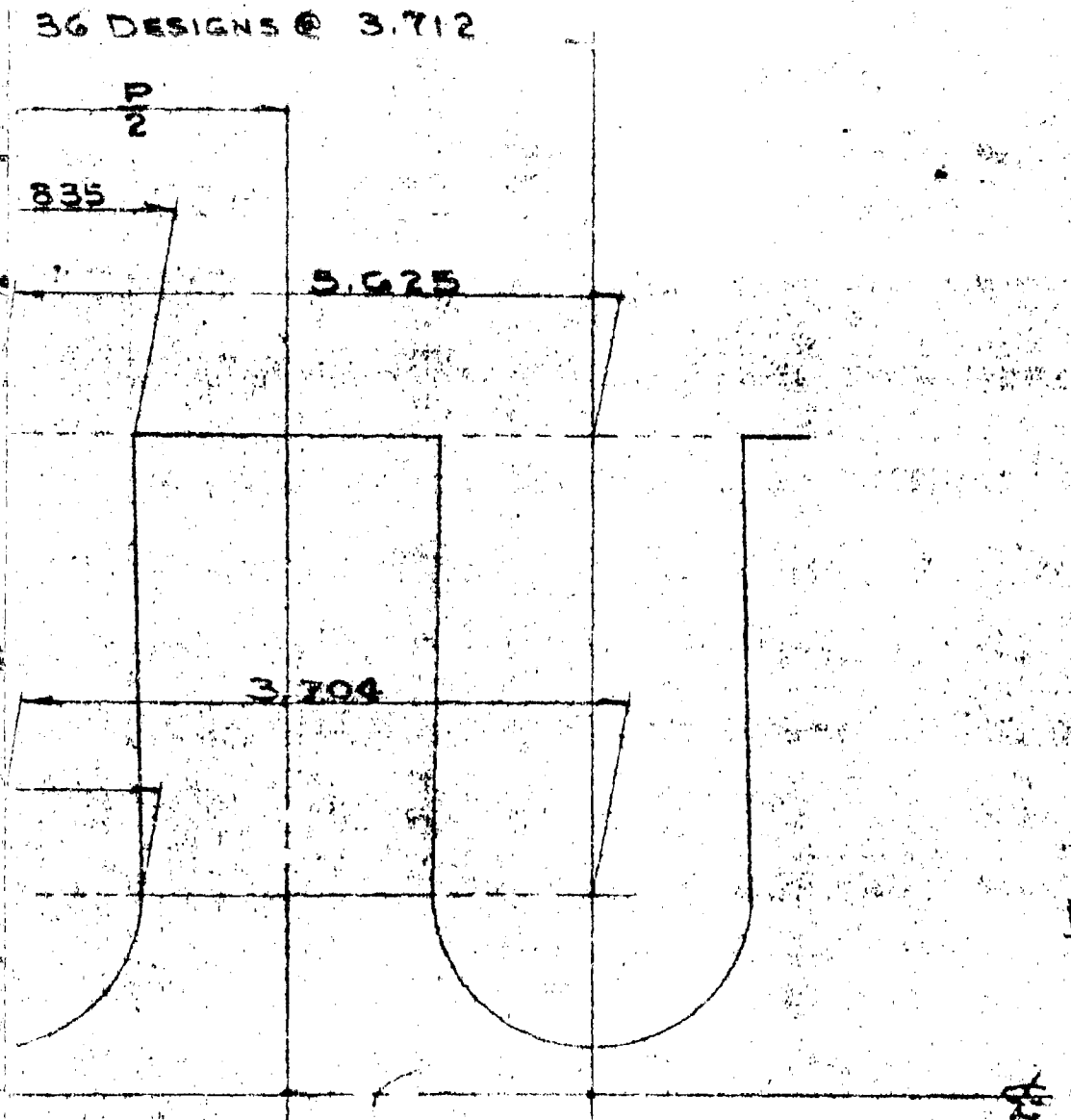
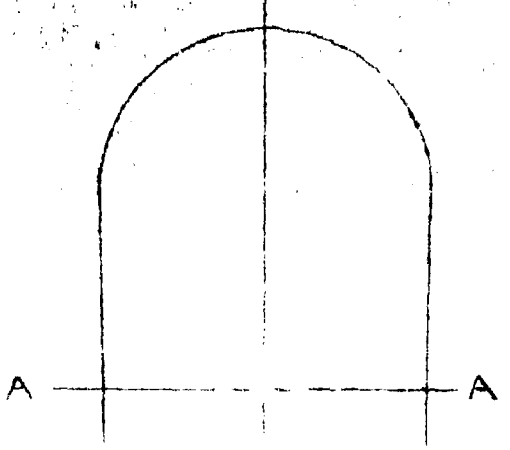


4

36 DESIGNS @ 3.712



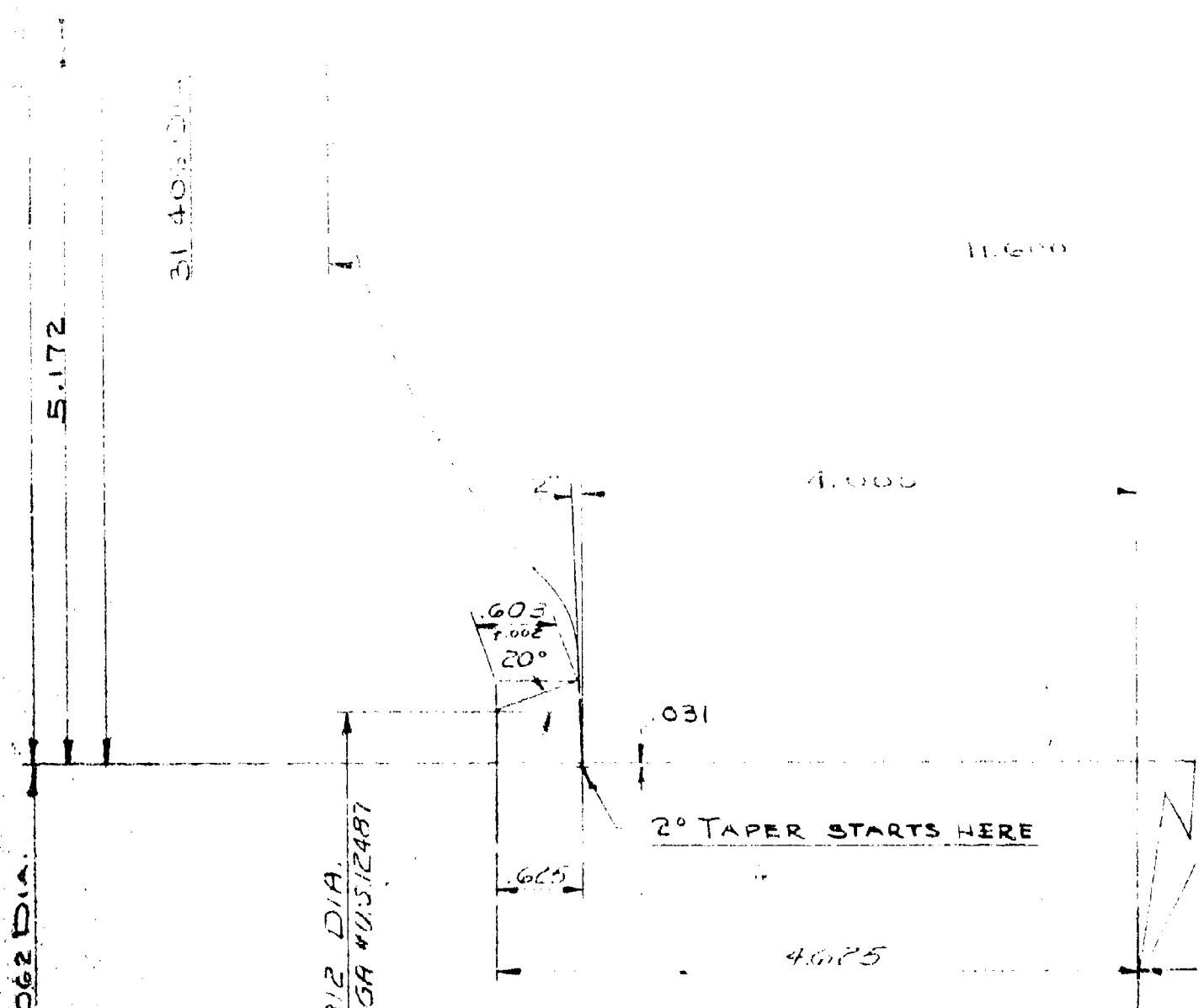
MALE HALF



FEMALE HALF

4

5



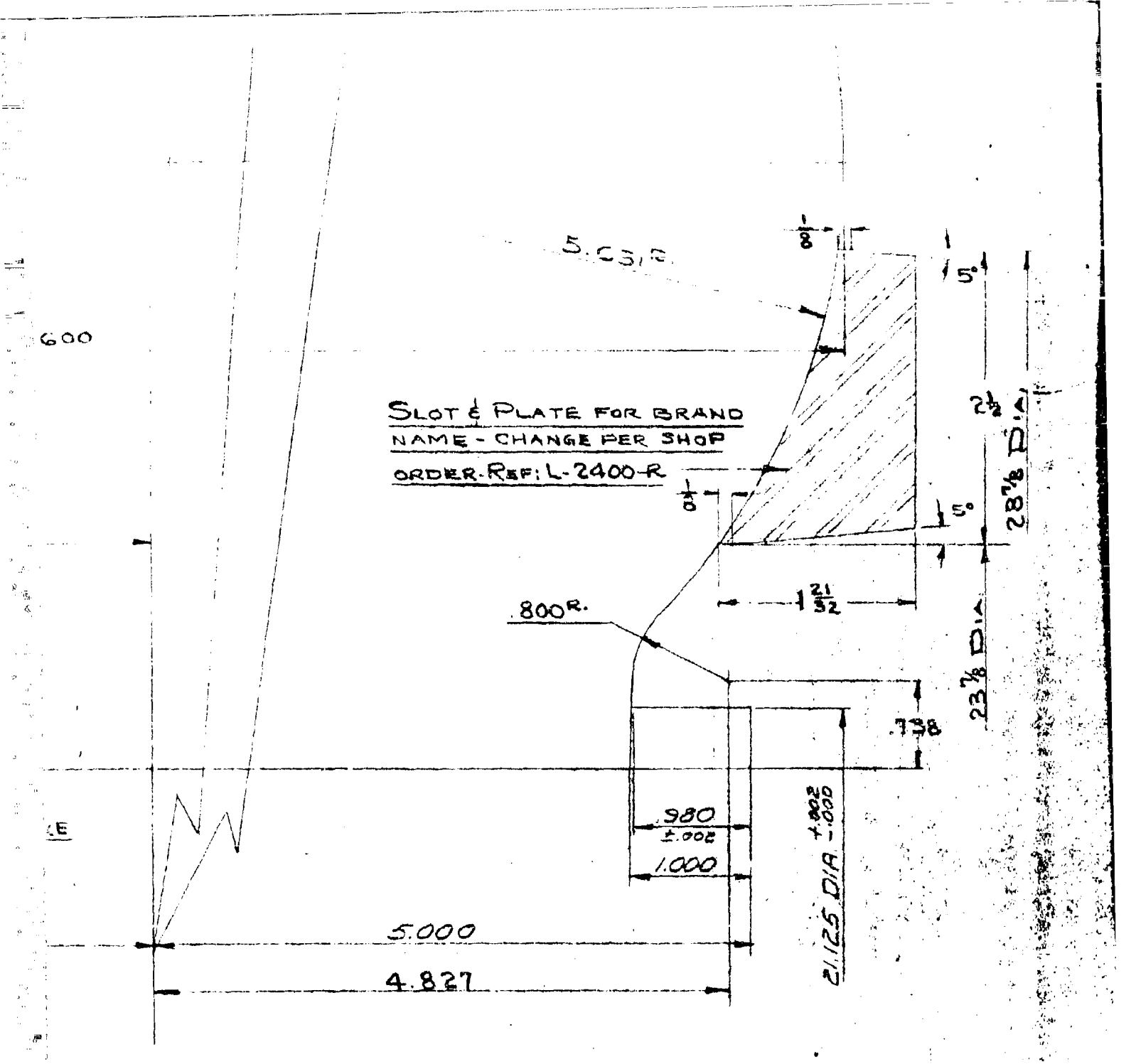
SECTION THRU MOLD

TEMPLETS :

U.S. 49023 CAVITY SHAPE (UPPER)

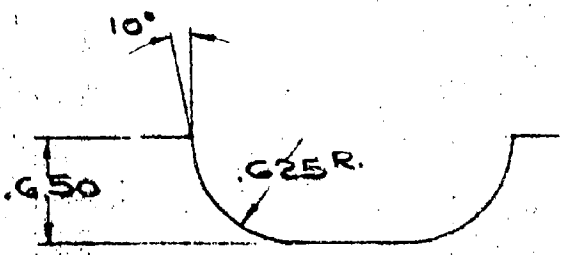
U.S. 49024 TREAD DESIGNS

6

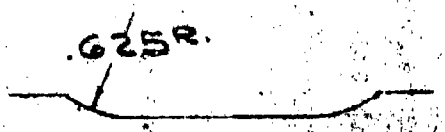


TOE RING N° T-779

7

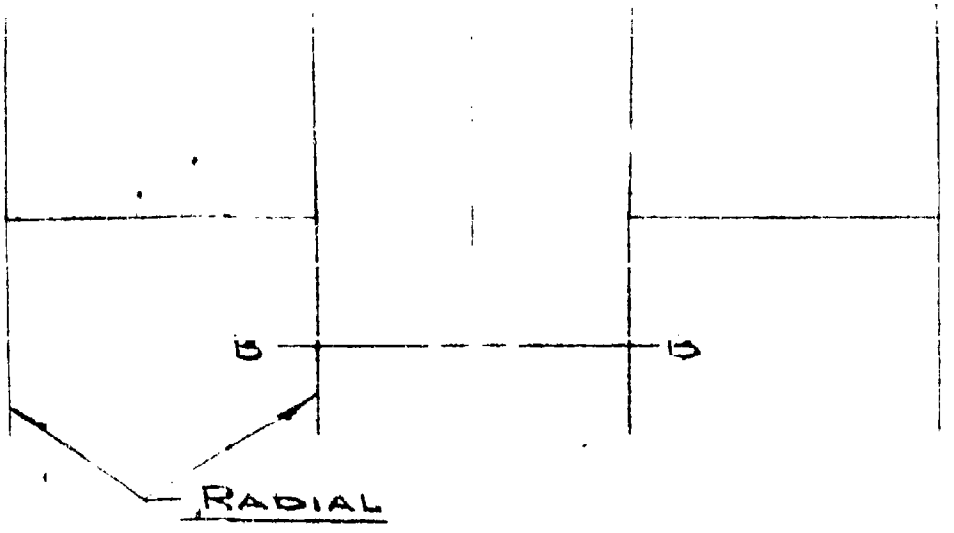


SECTION A-A



SECTION B-B

8



T.W. = 72.5% OR 11.47

T.R. = 150% OR 11.47

$\frac{D.H.}{C.S.} = \frac{10.589}{11.600} = .913$

RIM FIT = 7.5 ADV. (TIGHT)

9

REF.	CHANGE

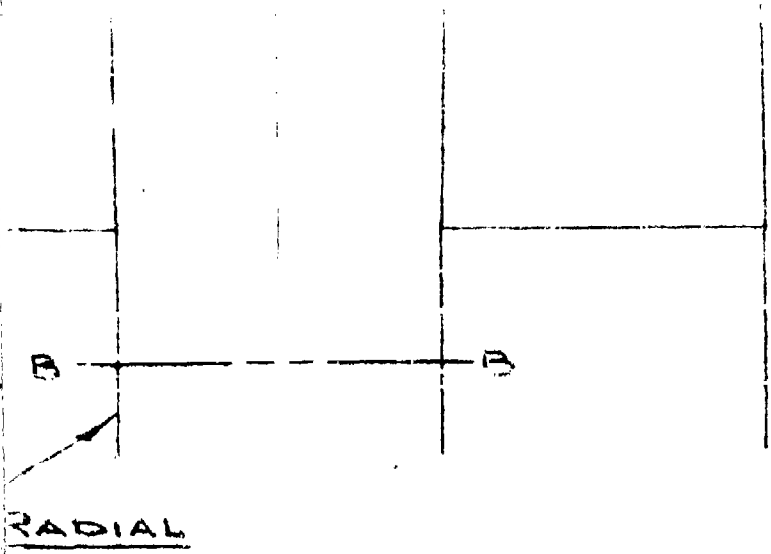
UNITED STATES RUBBER (
DETROIT — MICHIGAN

11.00-20 U.S. ROYAL T
EXPERIMENT

TYPE "D"

RECUT & INSTALL TREAD R
DWG. Nº P-11523-F

PRODUCT DEVELOPMENT DIVISION		MOLD DIVISION	
DRAWN BY	DATE	DRAWN BY	SUBMITTED
	8-12-53	SHERRILL	



RADIAL

10

T.W. = 72.5% OF 11.47

T.R. = 150% OF 11.47

$\frac{D.H.}{C.S.} = \frac{10.589}{11.600} = .913$

RIM FIT = 7.5 ADV. (TIGHT)

9

REF.	CHANGE	DATE	SUB.

UNITED STATES RUBBER COMPANY
DETROIT — MICHIGAN

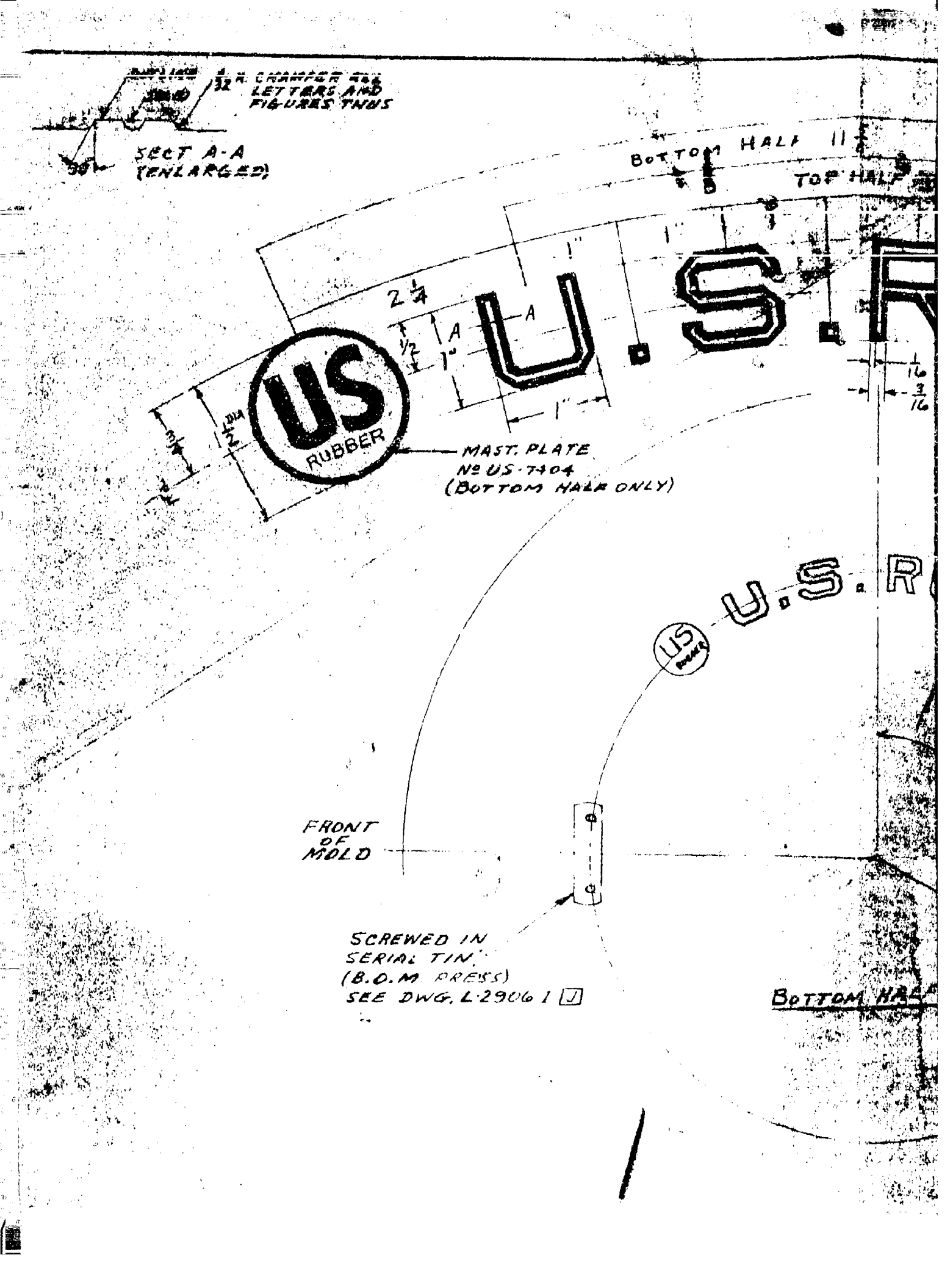
11.00-20 U.S. ROYAL TACTICAL
EXPERIMENTAL

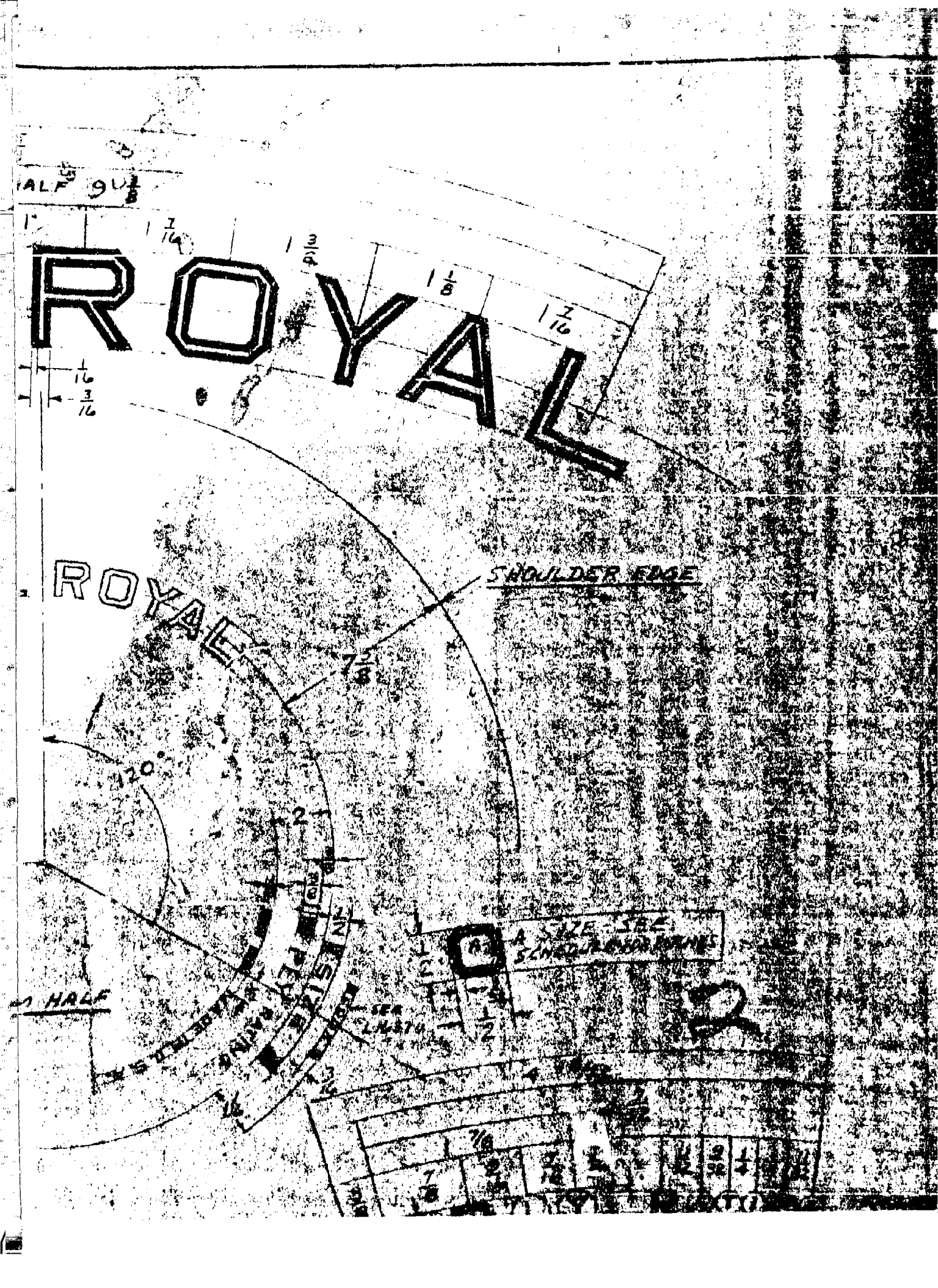
TYPE "D"

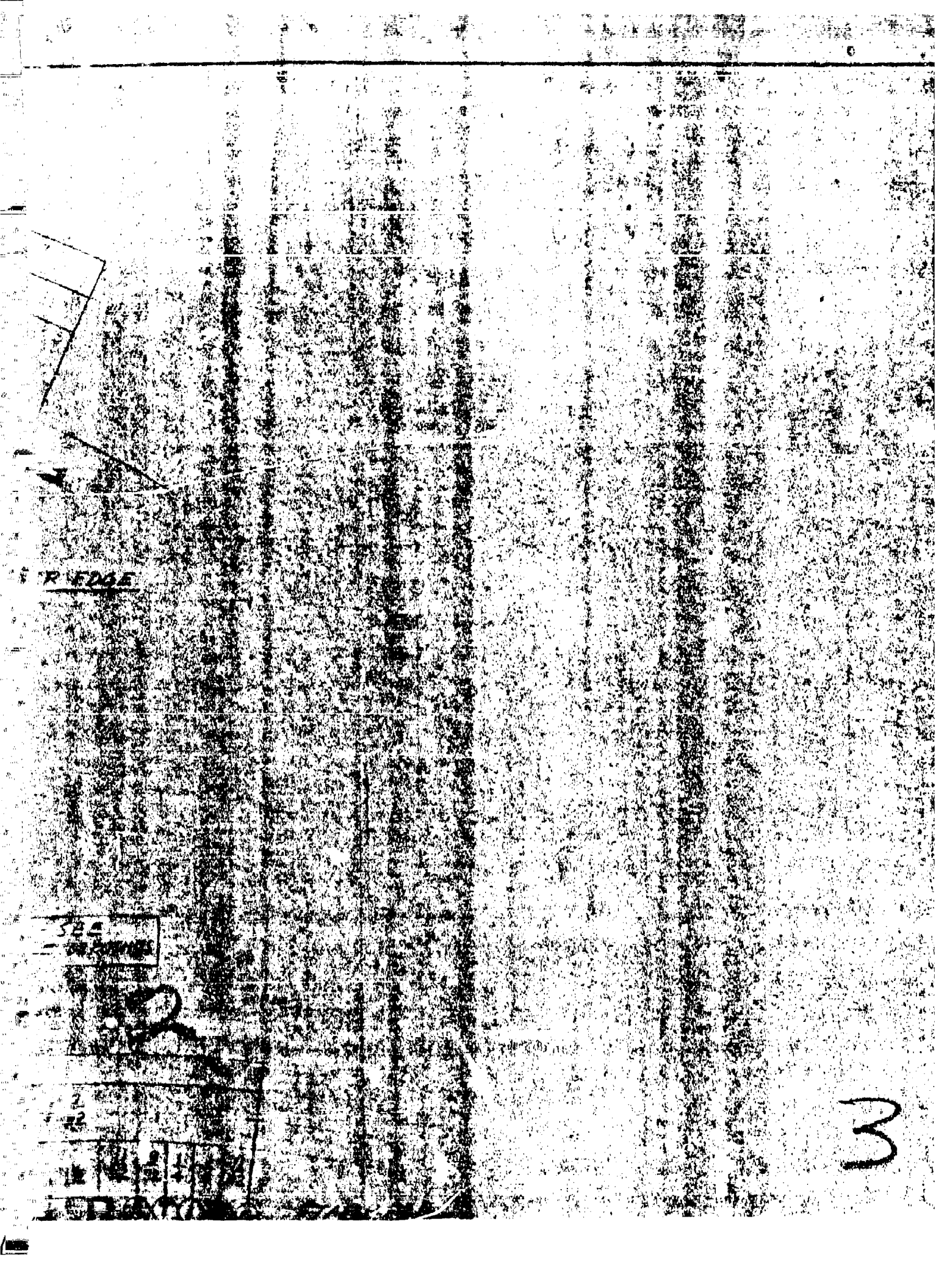
RECUT & INSTALL TREAD RING, TYPE "AE"
Dwg. No P-11525-F

PRODUCT DEVELOPMENT DIVISION	MOLD DIVISION	SCALE - FULL
DRAWN BY	DATE 8-12-59	DRAWN BY SUPERVISOR

D 11007


1/32 R. CHAMFER ALL LETTERS AND FIGURES THUS
SECT A-A (ENLARGED)
30°
BOTTOM HALF
TOP HALF
U.S.R
2 1/4
1/2
A
1"
1/16
3/16
3/4
1 DIA
US RUBBER
MAST. PLATE
Nº US-7404
(BOTTOM HALF ONLY)
FRONT OF MOLD
SCREWED IN SERIAL TIN.
(B.O.M PRESS)
SEE DWG. L-29061 J
BOTTOM HALF

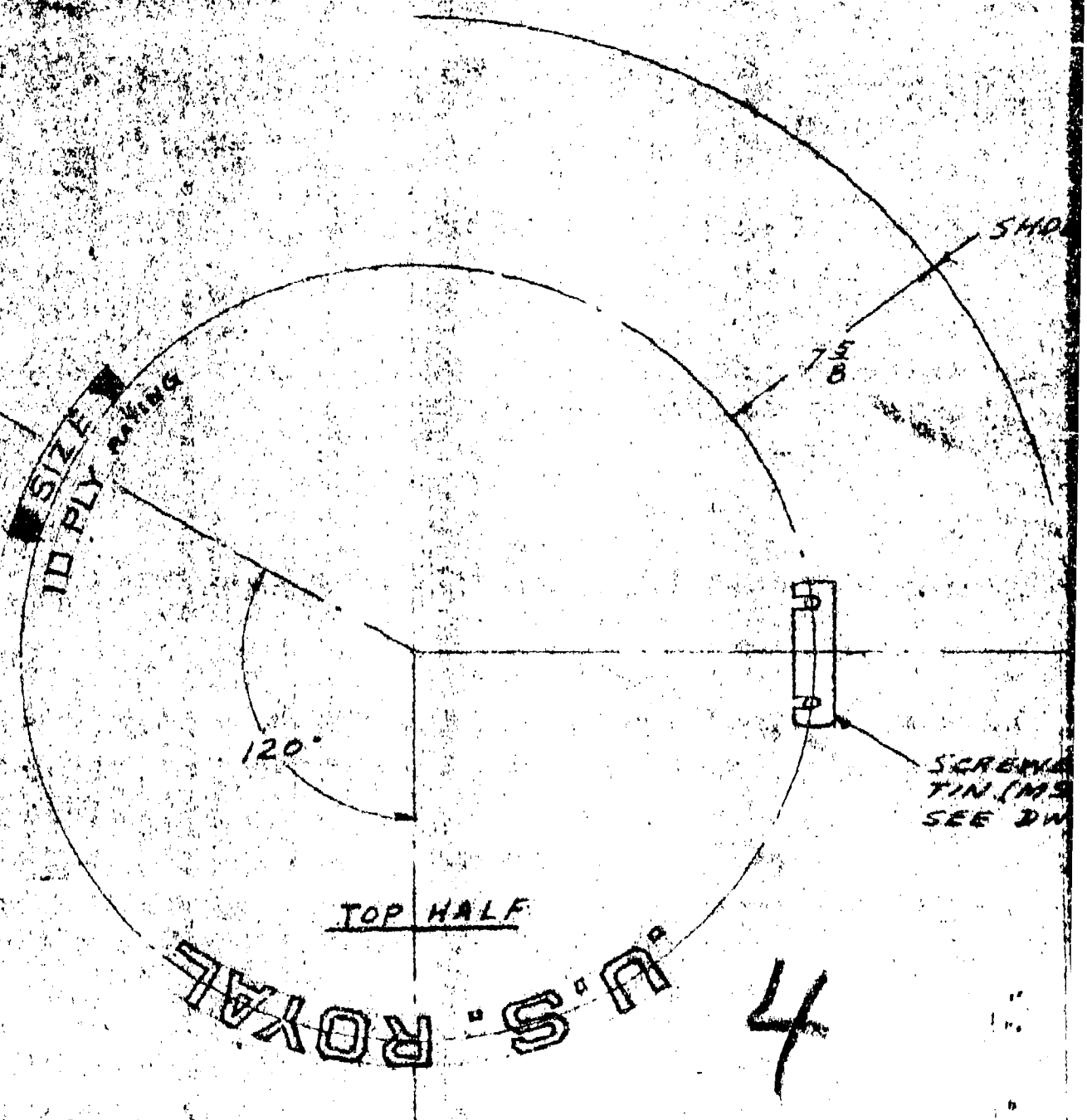

ROYAL
ROYAL
SHOULDER EDGE
120°
HALF
SEA
LENGTH


R EDGE

THE WORDS "U.S. ROYAL" MUST APPEAR DIAMETRICALLY OPPOSITE IN TWO

ALL LETTERING IN MOLD IS LEFT HAND, MAX. DEPTH = .031

ALL PITCHES TAKEN AT TOP OF LETTERS AND FIGURES

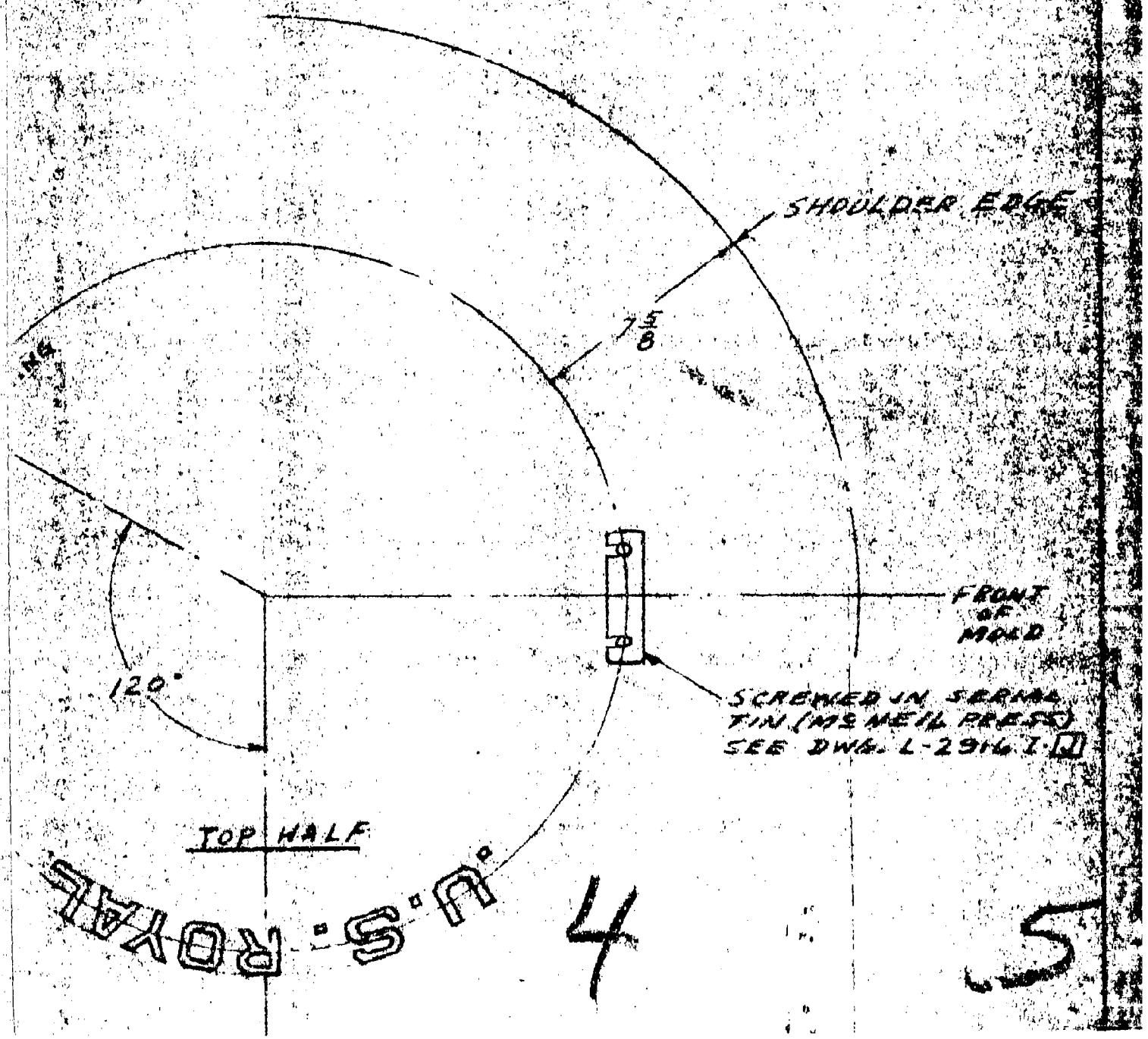


4

F. AL MUST APPEAR DIAMETRICALLY OPPOSITE IN TWO HALVES OF MOLD

MOLD IS LEFT HAND, MAX. DEPTH = .031

OPEN AT TOP OF LETTERS AND FIGURES



U.S. ROYALS

4

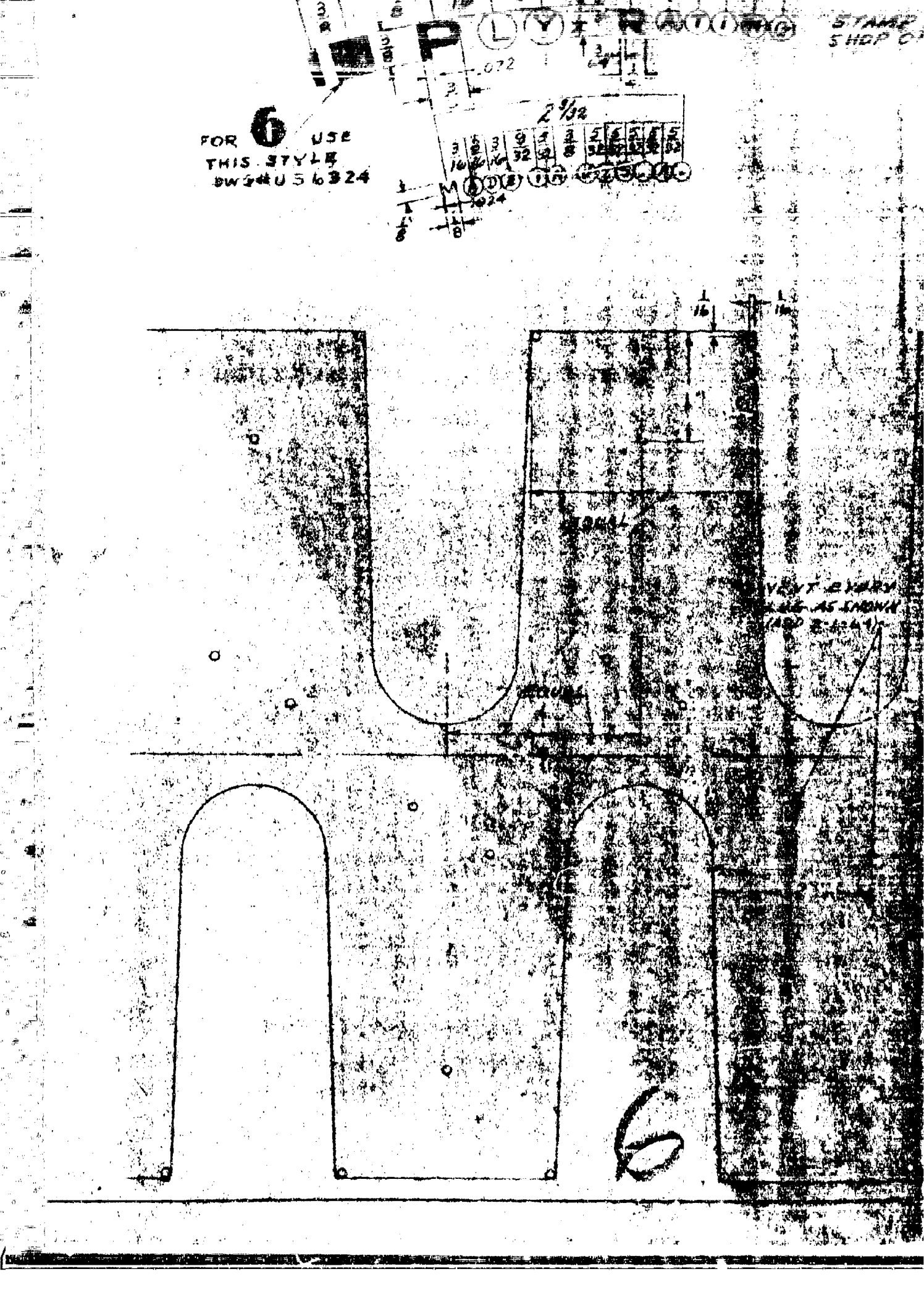
5

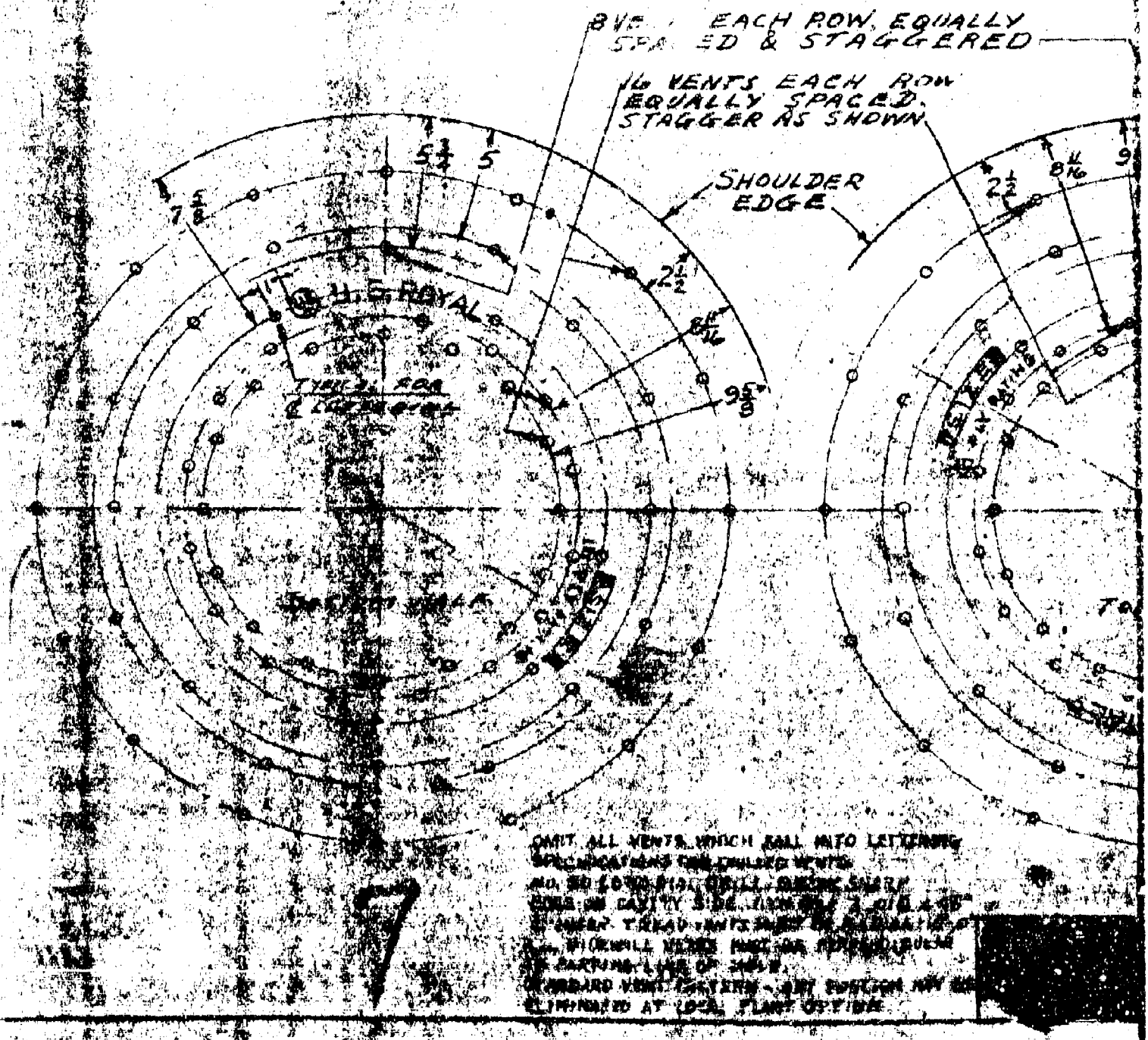
1

5

2 27/32			
19/32	3/4	3/4	3/4

1	6	-	2	0


FOR 6 USE
THIS STYLE
DWG# U56324

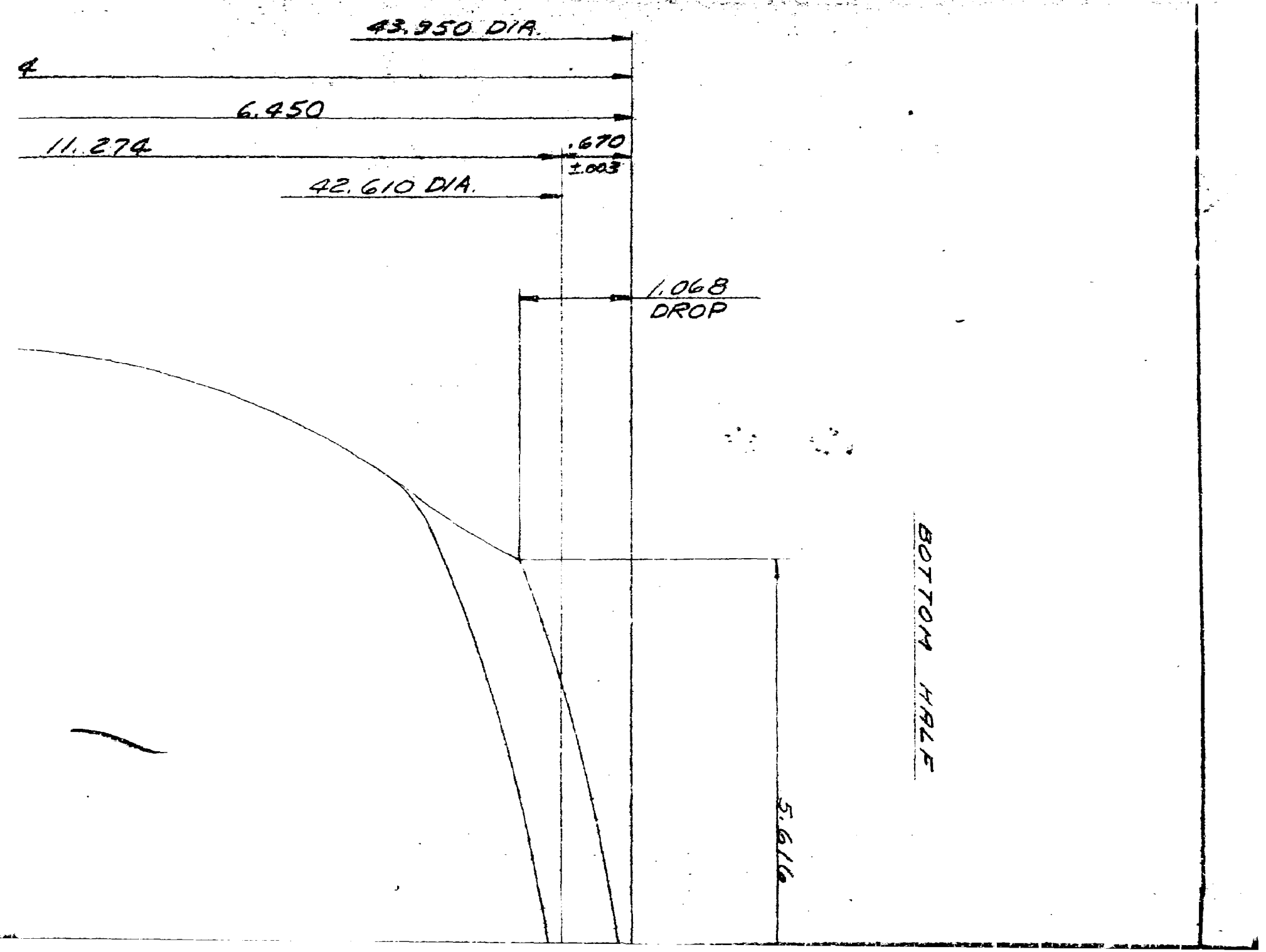

EACH ROW EQUALLY SPACED & STAGGERED
16 VENTS EACH ROW EQUALLY SPACED. STAGGER AS SHOWN
SHOULDER EDGE
5 1/4
5
7 5/8
2 1/2
8 11/16
9 5/8
9
2 1/2
8 11/16
OMIT ALL VENTS WHICH FALL INTO LETTERING

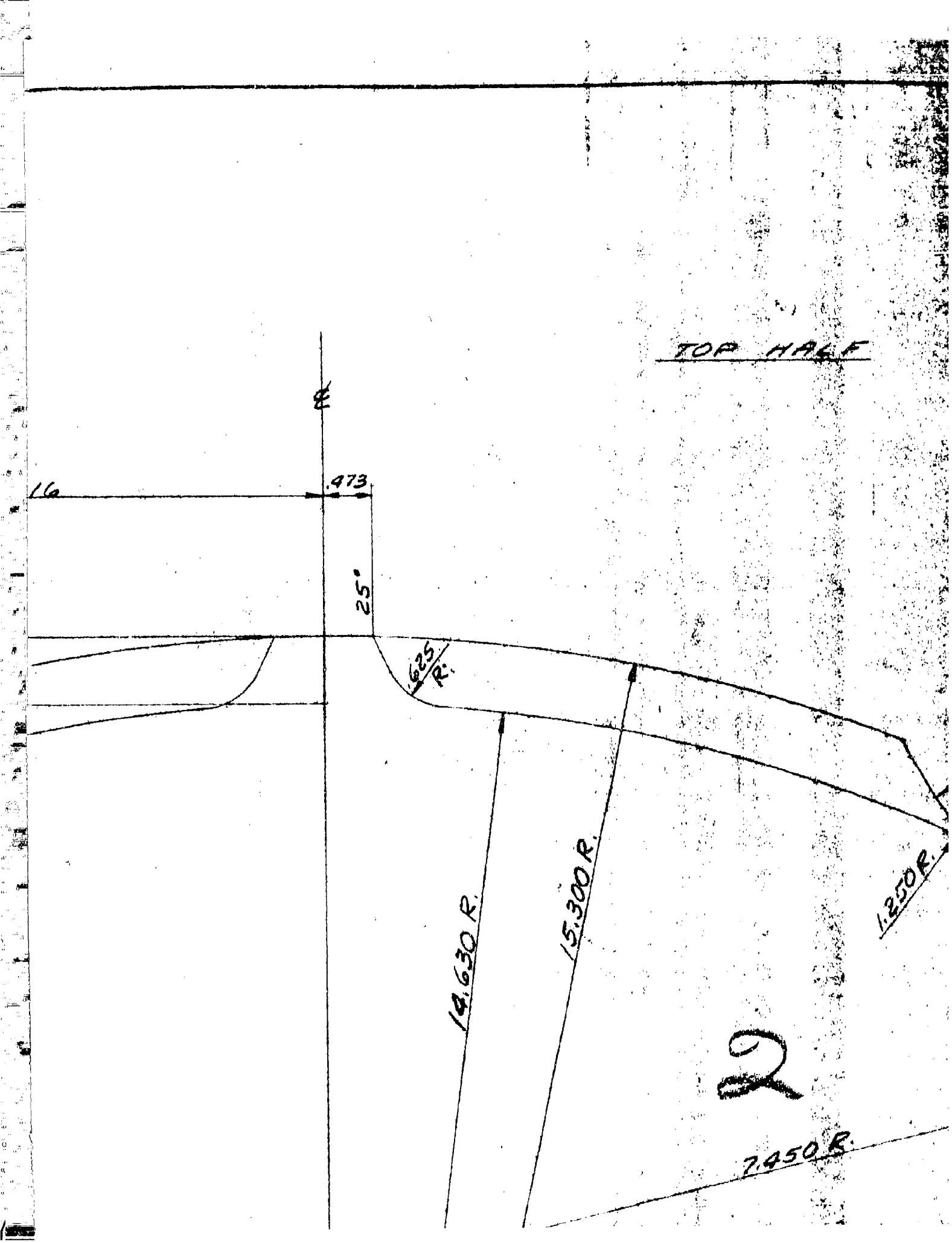
REF.	CHANGE	DATE
	CHANGE CURE TREAD VENTS AREA	2-1-60

UNITED STATES RUBBER COMPANY
DETROIT - - MICHIGAN

LETTERING AND MARKING SHEET
L.C. MOHAR
EXPERIMENTAL TRUCK TIRE
PAPER PLY

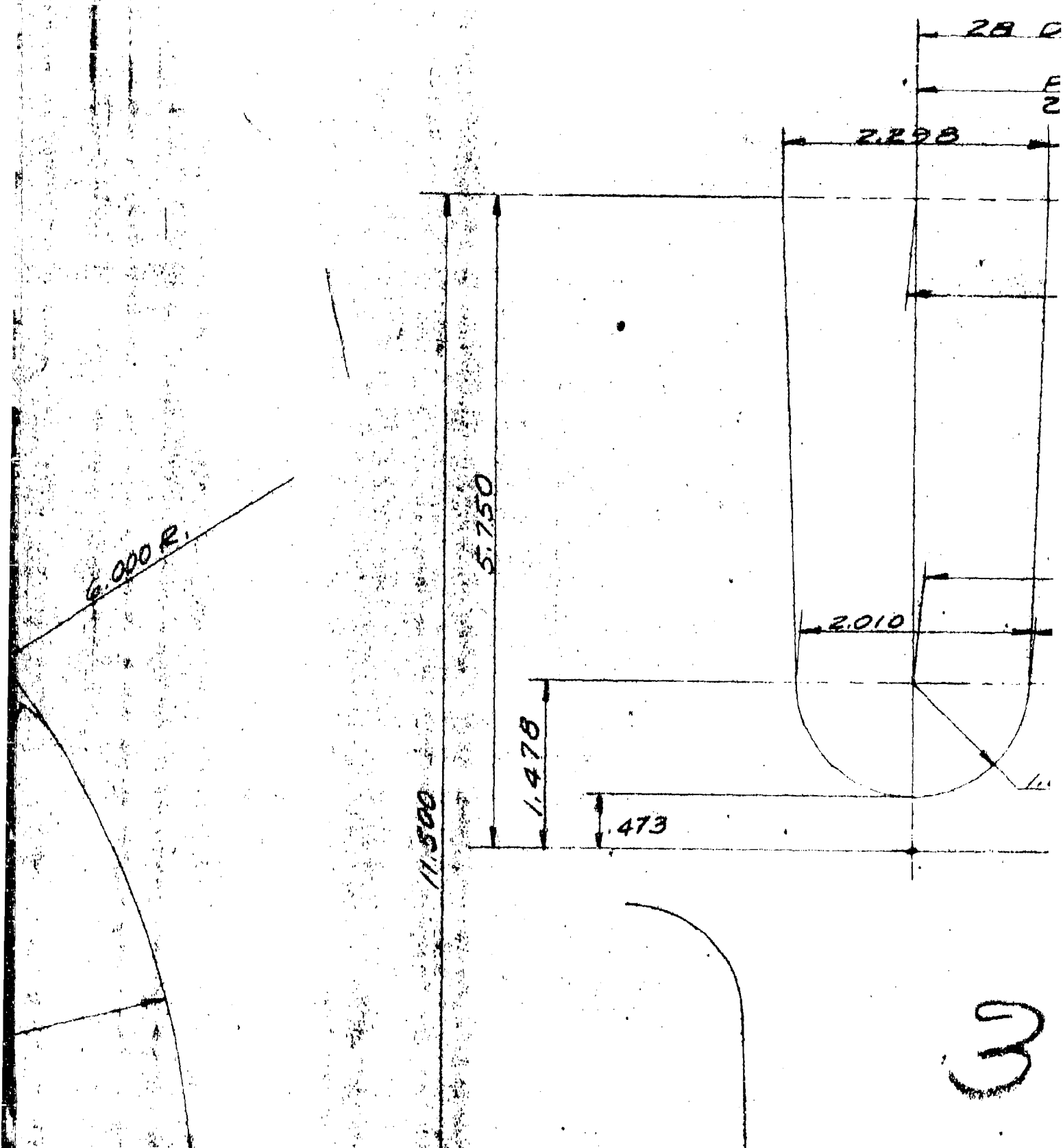
US 7.00-15 U-
L-1637-U
L-2016 E-U
WHITE SIDEWALL


43.950 DIA.
℄
6.450
11.274
.670
±.003
42.610 DIA.
1.068
DROP
BOTTOM HALF
5.616


TOP HALF
℄
1.6a
.473
25°
.625 R.
14.630 R.
15.300 R.
1.250 R.
2.450 R.
2

THIS IS A TREAD VIEW OF THE TIRE.

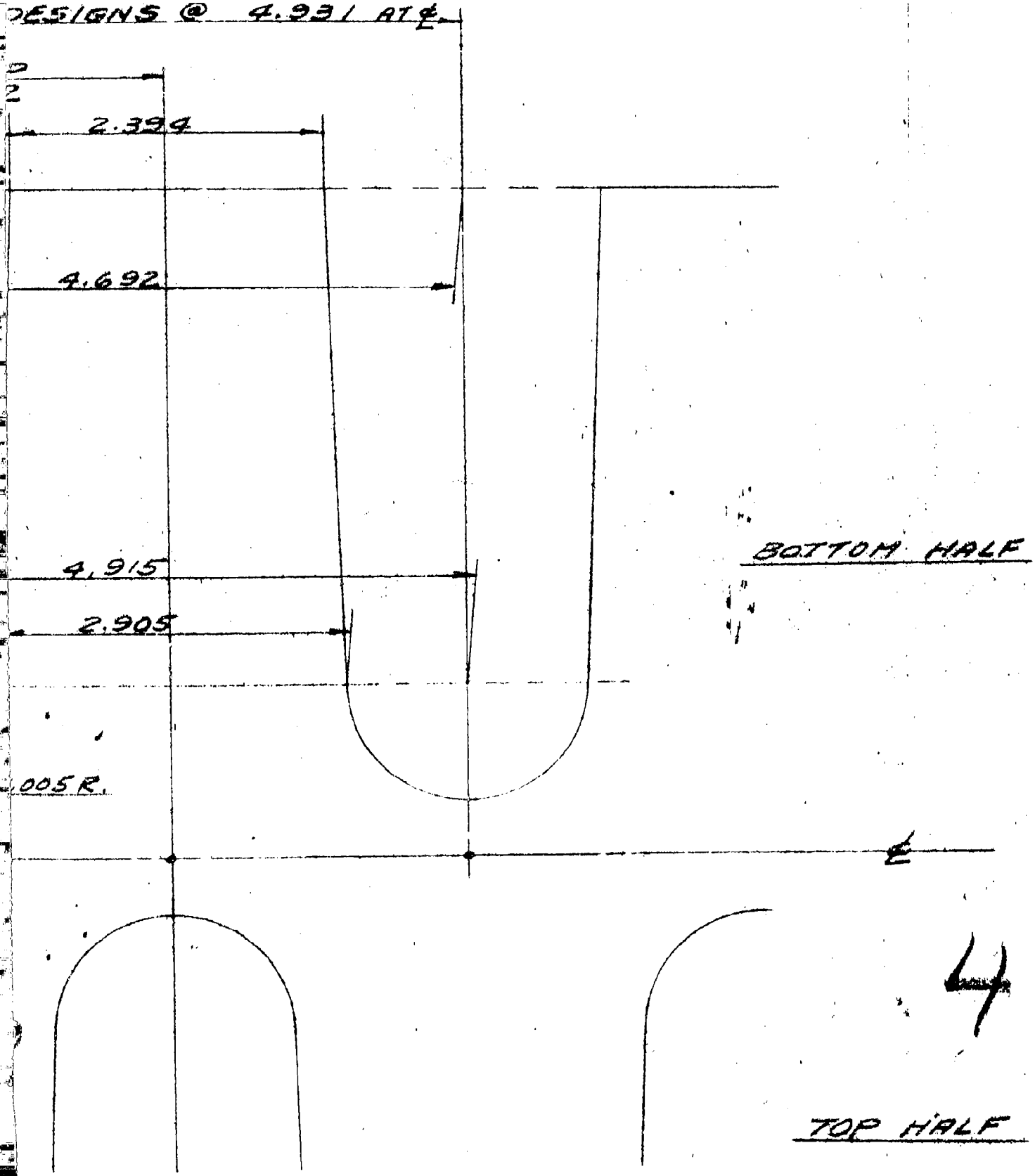
ALL DIMENSIONS SHOWN ARE DEVELOPED



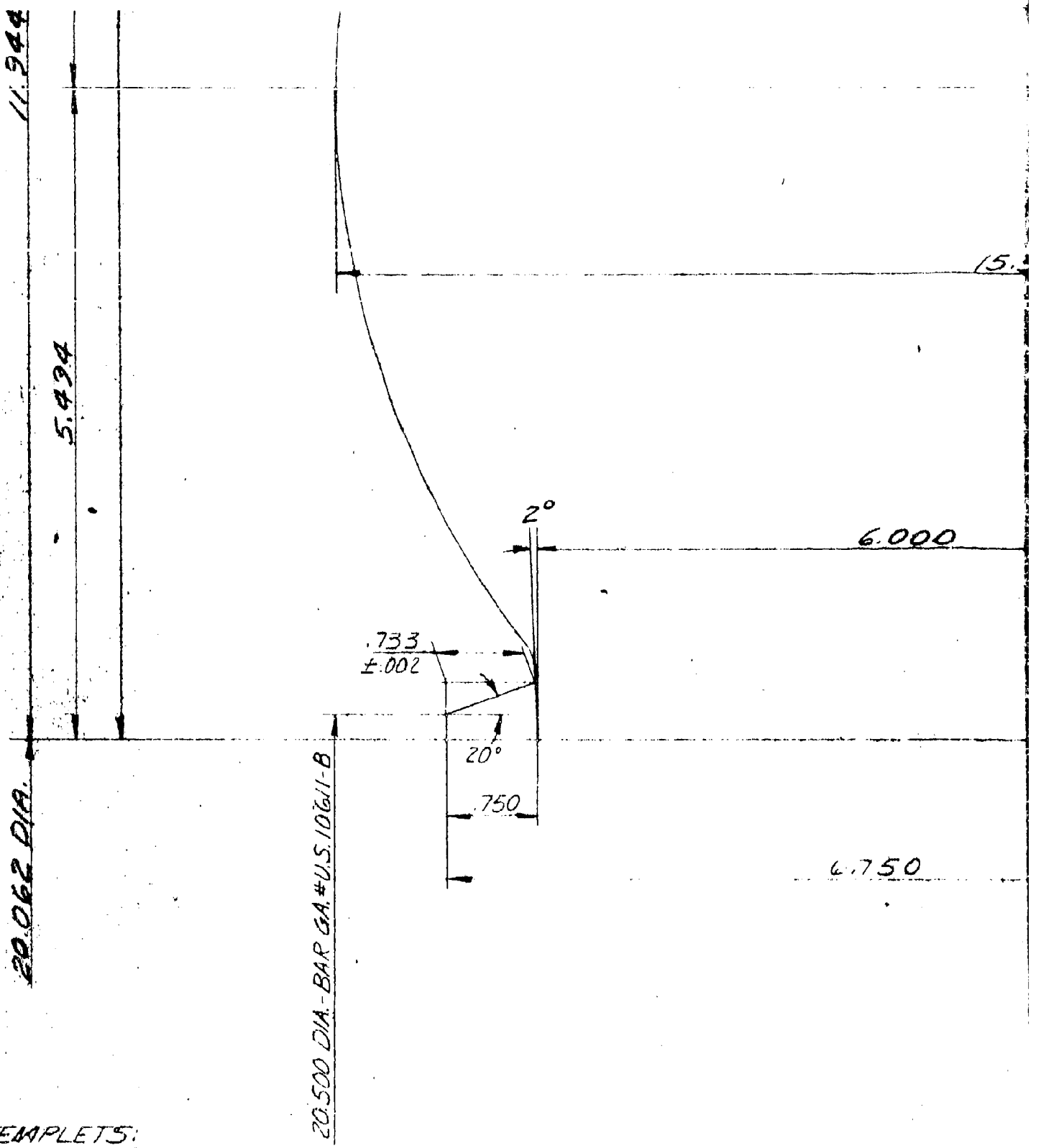
3

D LENGTHS.

DESIGNS @ 4.931 AT ℄.



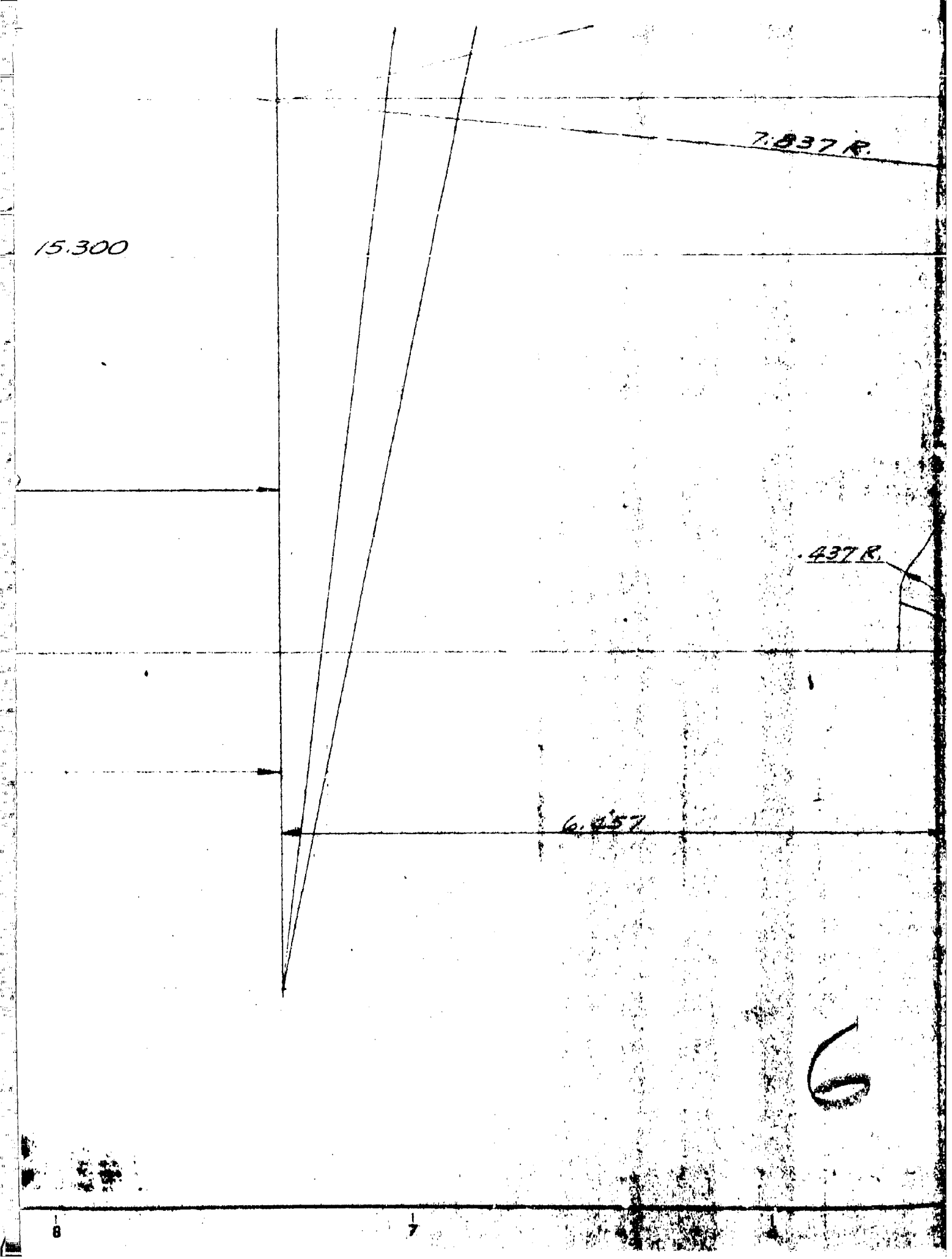
4

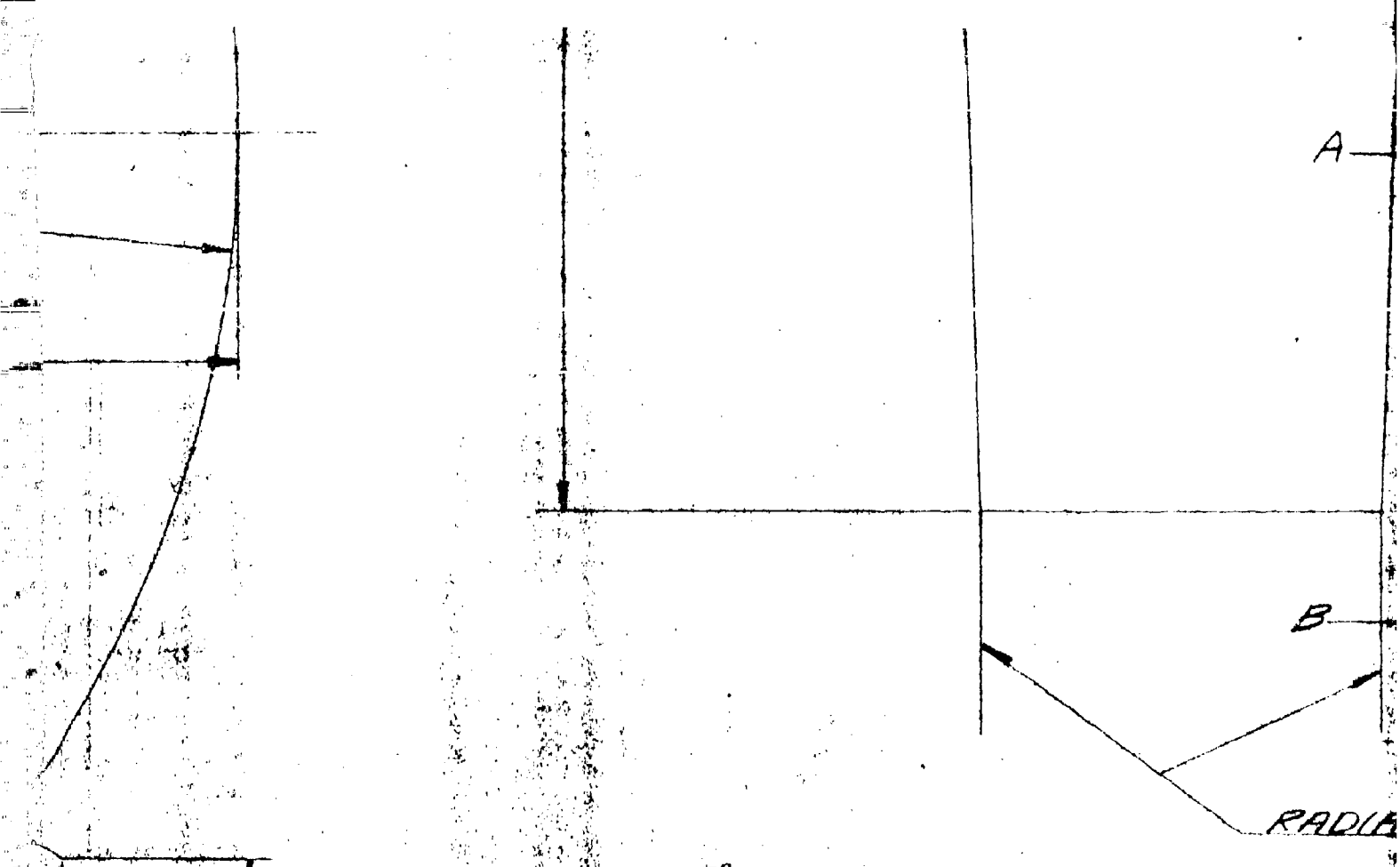


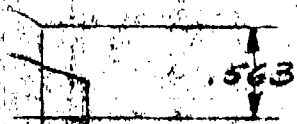
TEMPLETS:
#U.S 54566 CAVITY SHAPE & CENTER RIB
" 54567 TREAD DESIGN

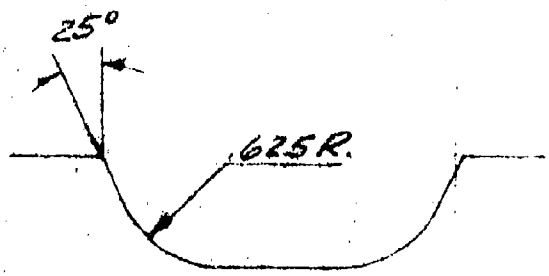
5

10 9 8

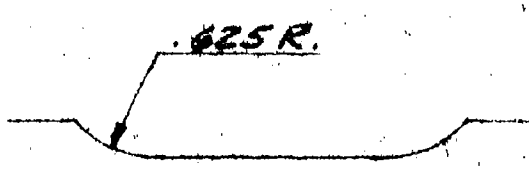

7.837 R.
15.300
.437 R.
6.857
6
8
7







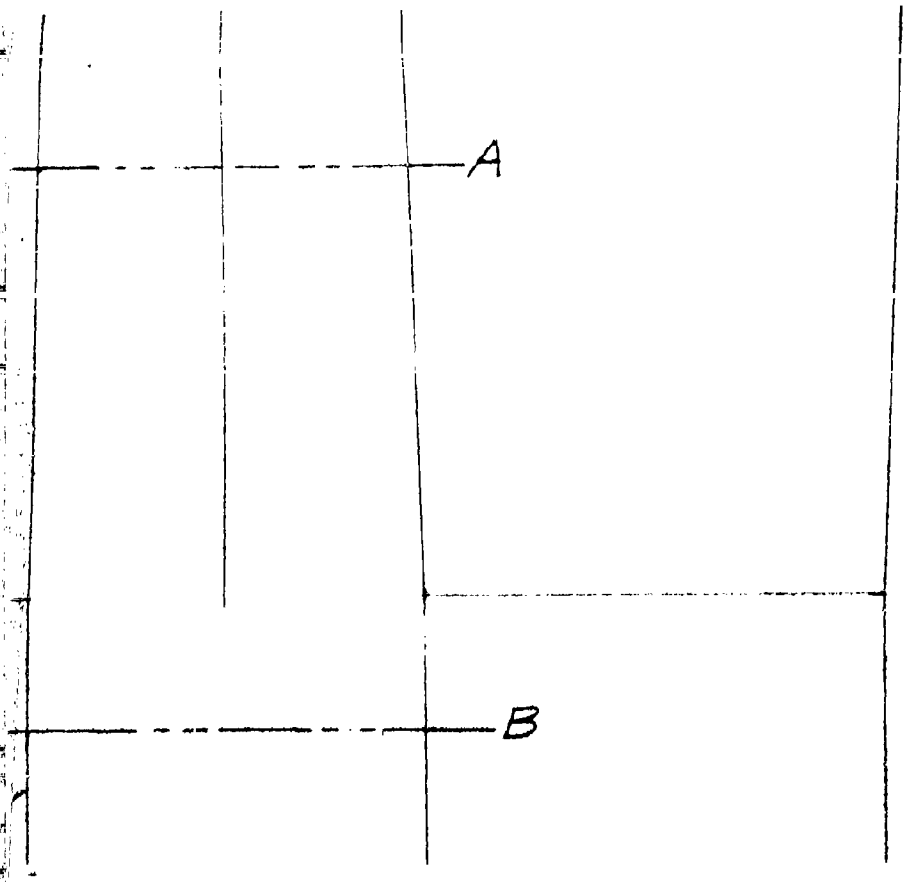
SECTION A-A



SECTION B-B

7

5 4 3



IAL

REF.	CHANGE	DATE	MAL
DEV. ER 3358-1	ADD LETTERING / VENTING & DWG Nº	11-1-63	2
	ADDED: RING SEAT DIM'S., MOLD NO., AND TEMPLETS.	10-28-63	1

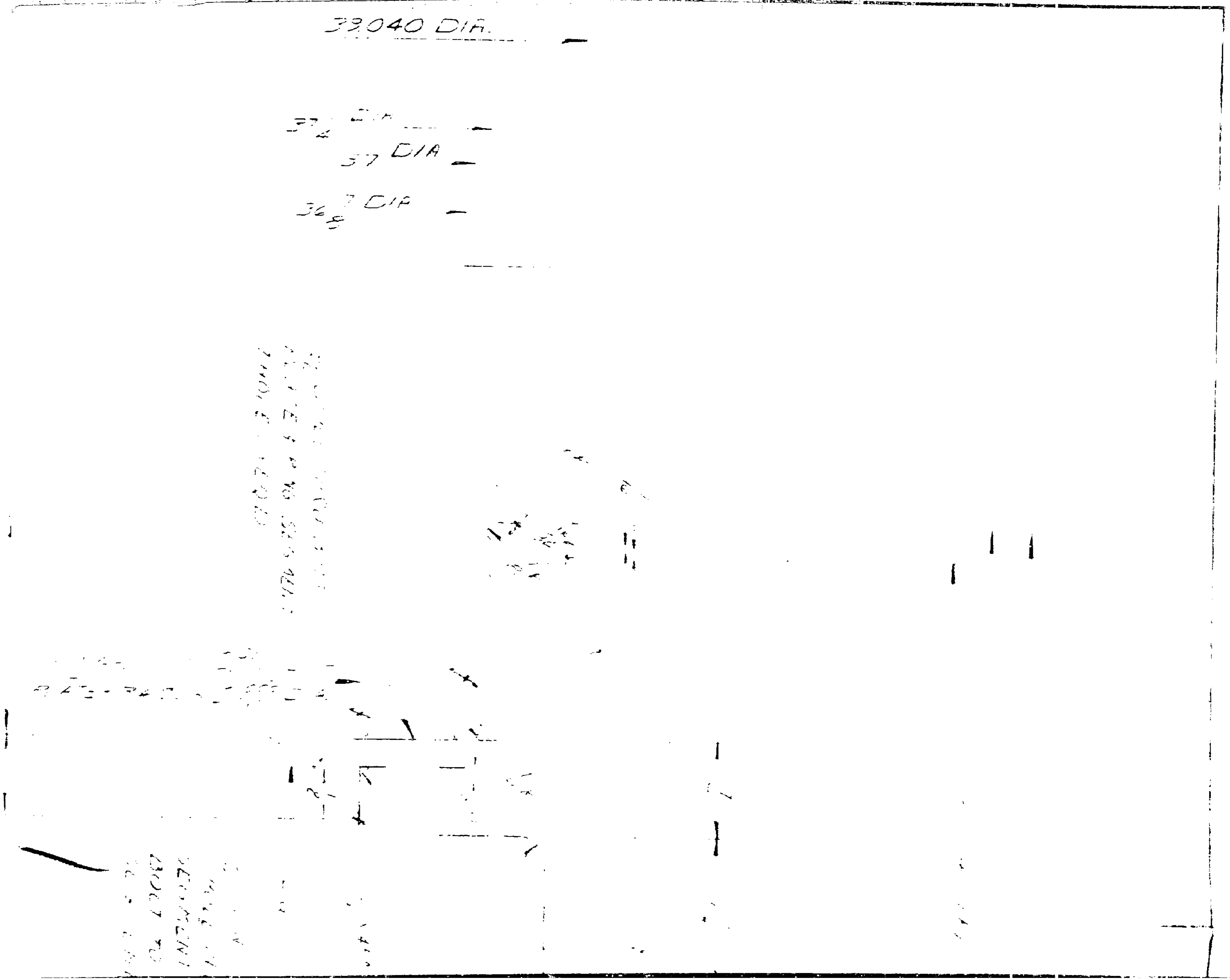
UNITED STATES RUBBER COMPANY
DETROIT — MICHIGAN

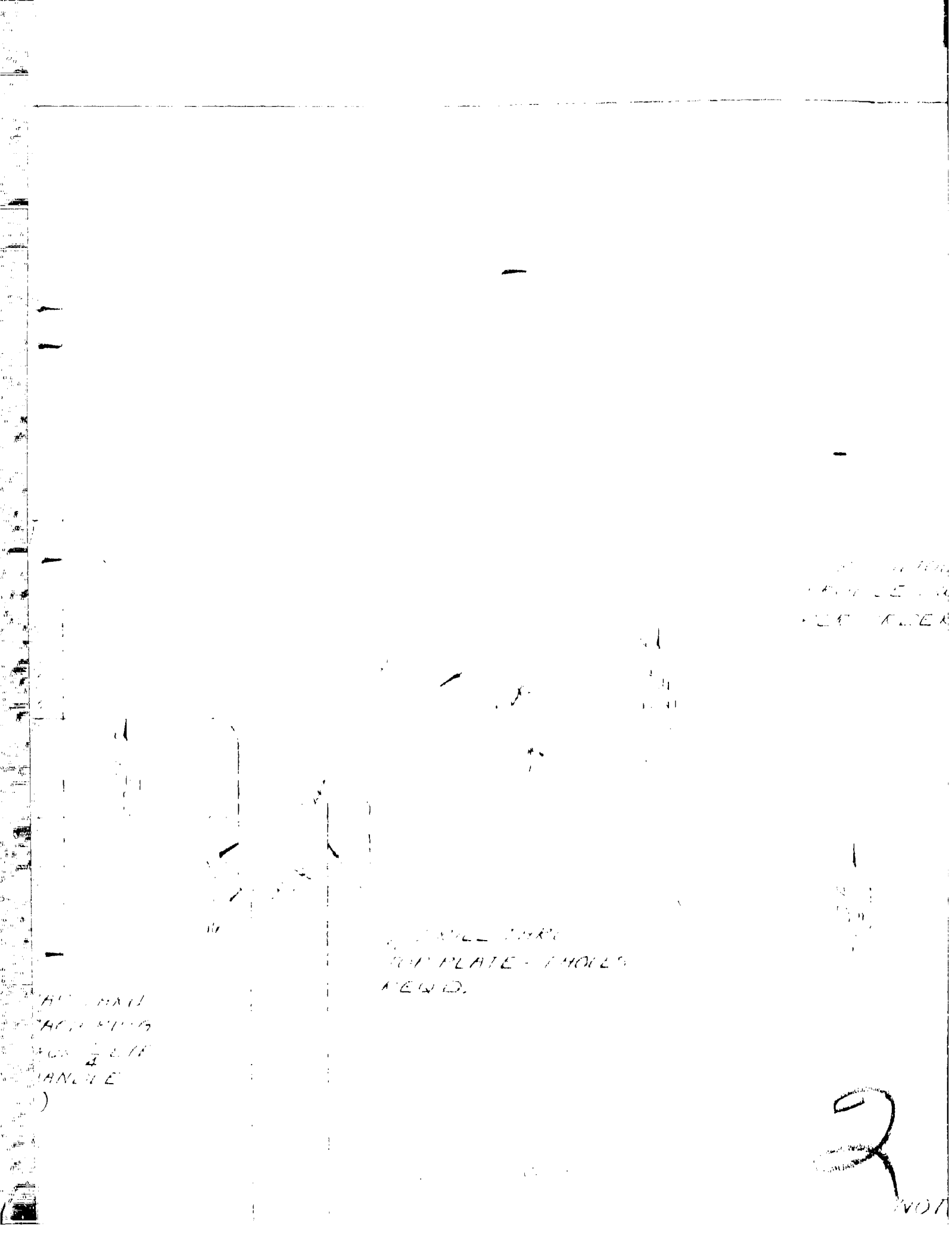
16-20 U.S. ROYAL
TRACTICAL C.C
TYPE "D"

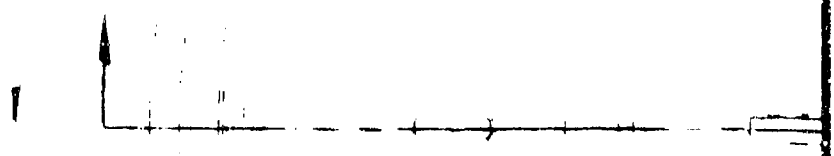
D. P. =
T. W. = 73.02% OF 15.75
T. R. = 97.14% OF 15.75
D.H. / C.S. = 11.224 / 15.300 = .737
RIM FIT = W-14L
N/G = 61.9 %
TOE RING NO. T-1854
VENTING DWG. NO. LV-3169 R-
MODEL NO.
MOLD DWG. NO. M-2313-R

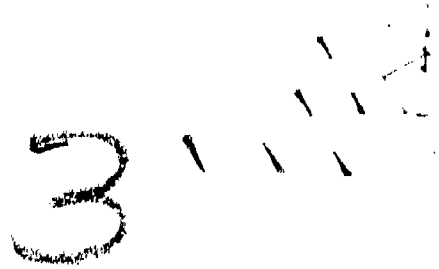
8

PRODUCT DEVELOPMENT DIVISION	MOLD DIVISION	SCALE = FULL
DRAWN BY C.C.W. DATE 10-3-63	DRAWN BY —	D 14017


33.040 DIA.
37 DIA



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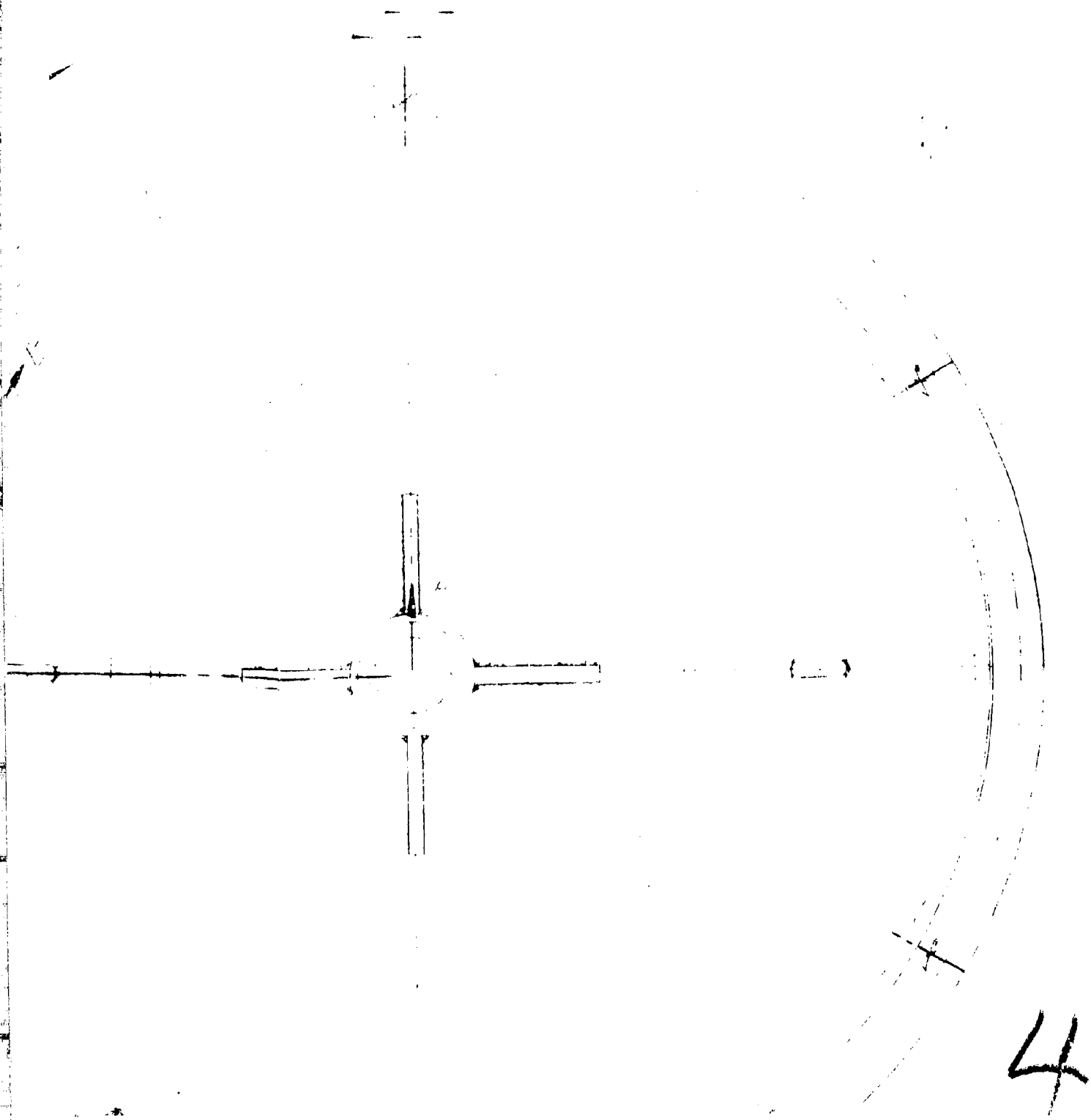

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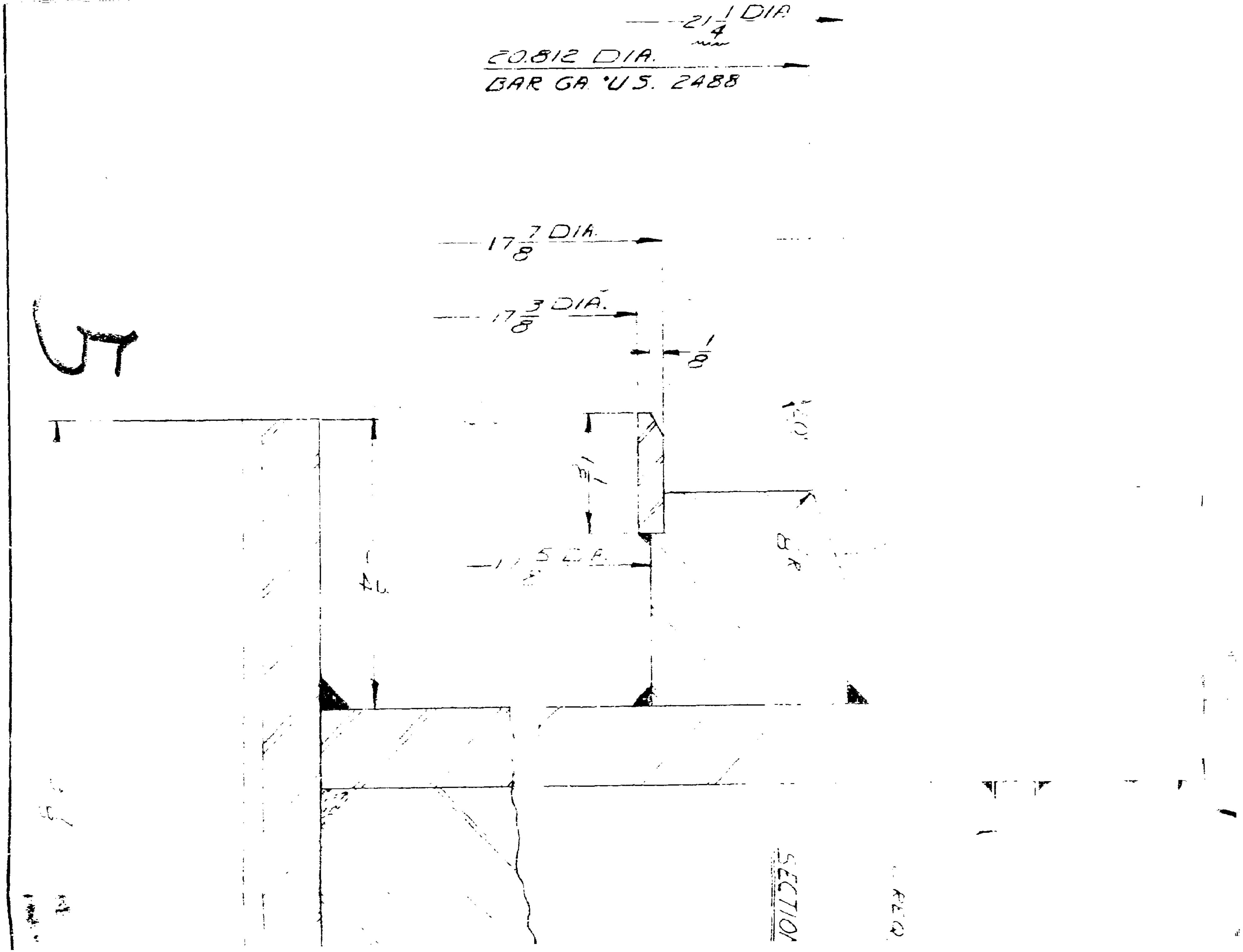
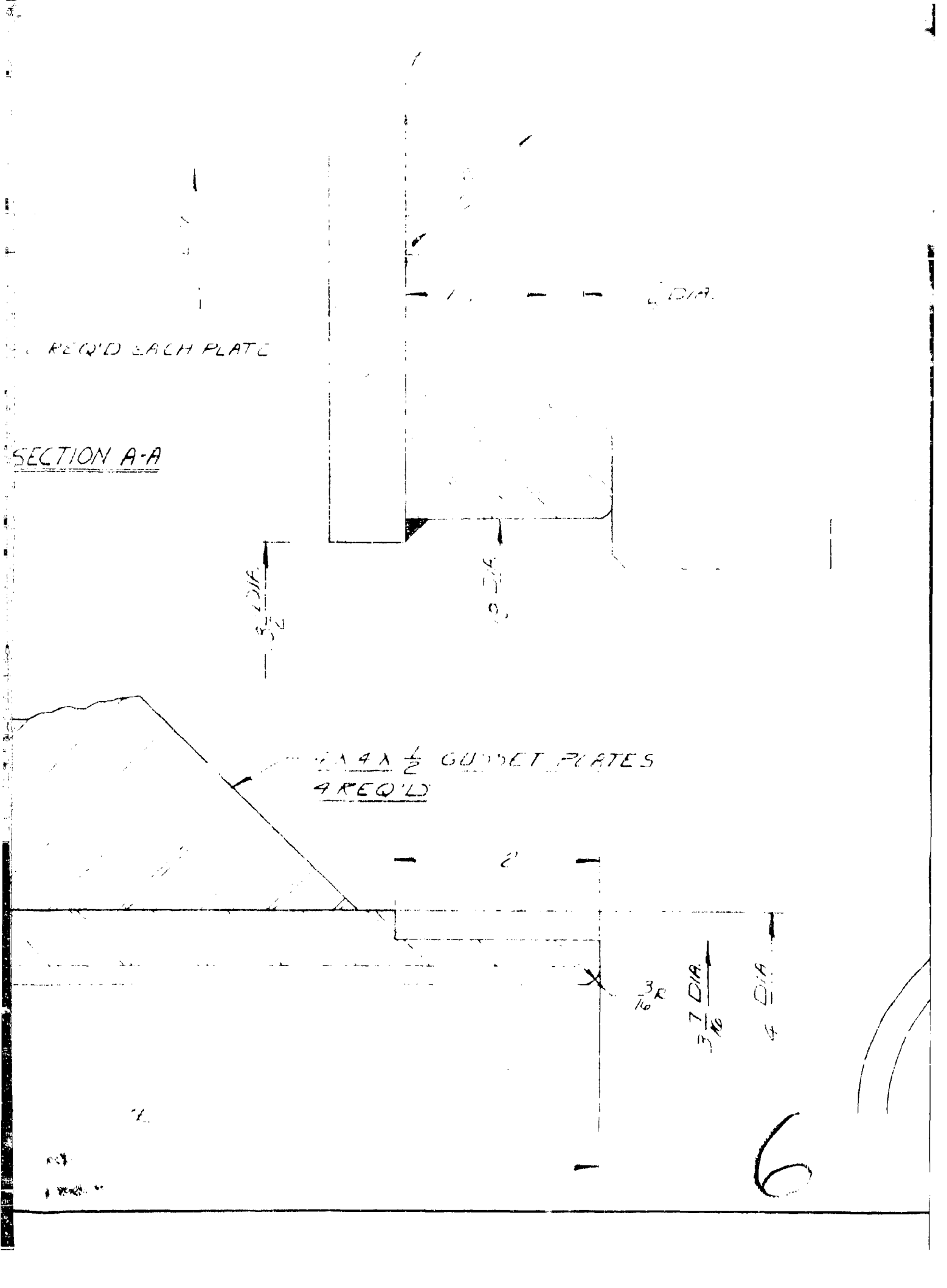
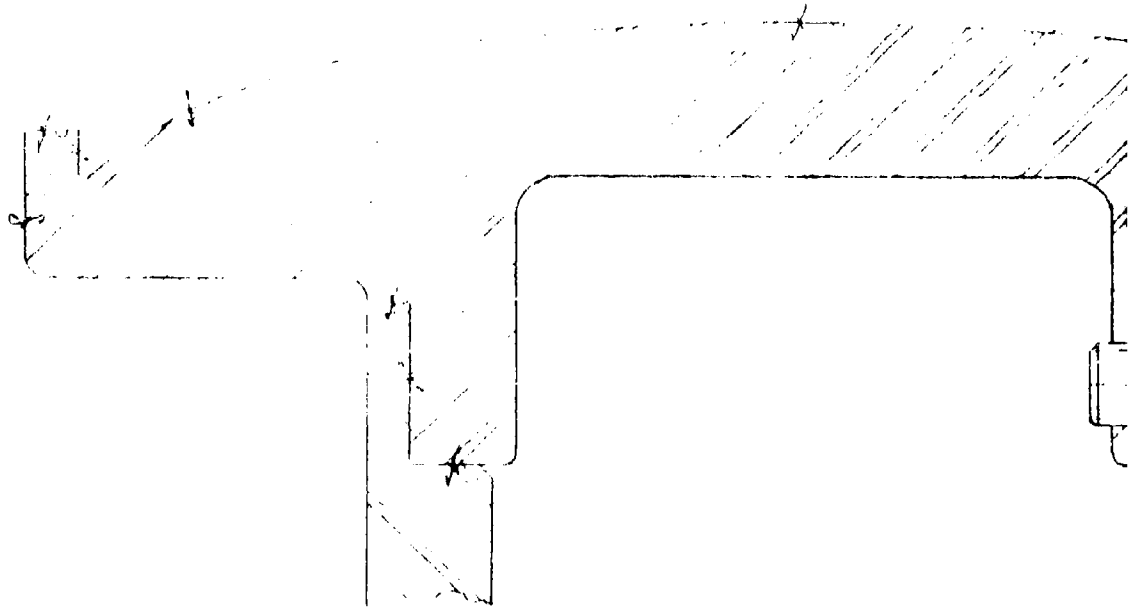
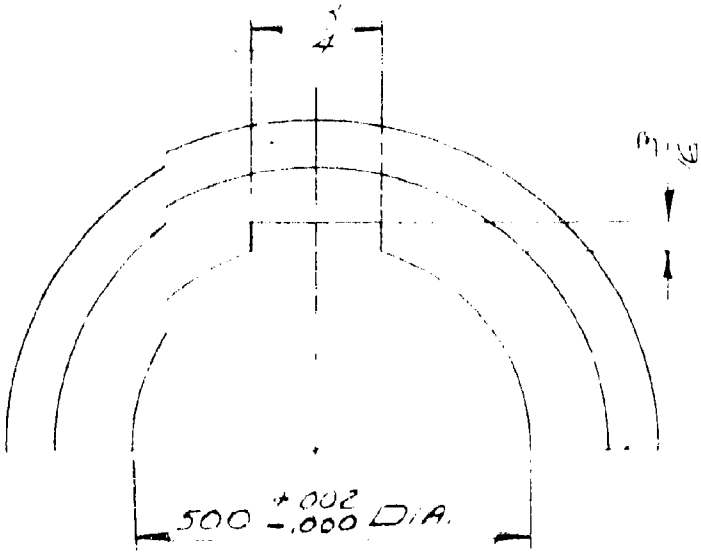


21 1/4 DIA
20.812 DIA.
BAR GA. U.S. 2488
17 7/8 DIA.
17 3/8 DIA.
1/8
SECTION
REQ.
5


REQ'D EACH PLATE
SECTION A-A
DIA.
DIA.
DIA.
GUSSET PLATES
REQ'D
DIA.
DIA.

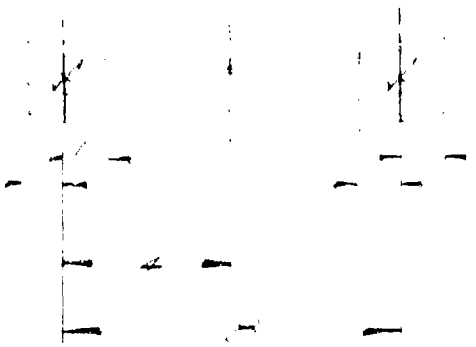


PARTIAL SECTION B-B
FULL SIZE



MATERIAL:
STEEL PLATE EXCEPT TRE
TREAD - STEEL CASTING
PATTERN # J-56

7



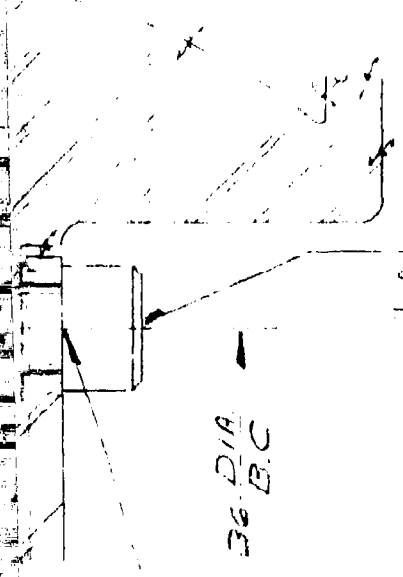
PLAN VIEW
½ SIZE

(1) PLACE SEGMENTS ON FLOOR IN AN APPROXIMATE CIRCLE. SEGMENTS TO BE HANDLED WITH AID OF ¾" EYE BOLT FOR WHICH A TAP HOLE IS PROVIDED ON THE TOP SIDE ANGLE IN THE CENTER OF EACH SEGMENT.

(2) PLACE TOP PLATE ON TOP OF ASSEMBLED RING SEGMENTS, ALIGN PLATE AND FASTEN WITH BOLTS AT ENDS OF SEGMENTS

(3) LIFT ASSEMBLED UNIT ONTO BOTTOM PLATE PLACE UNIT SO THAT HOLES LINE UP WITH SCREWS PROJECTING FROM BOTTOM PLATE. FASTEN SECURELY

(4) ASSEMBLY IS NOW COMPLETE AFTER NECESSARY STEPS TO MAKE TREAD ARE COMPLETED, REVERSE ABOVE PROCEDURE TO REMOVE TREAD FROM SEGMENTS.



½ - 13 N.C. SOCK HD CAP SCR. 1 LONG. - 14 REQ'D

36 DIA B.C.

IN TOP PLATE:
17/32 DRILL THRU -
4 HOLES REQ'D
IN RING SEGMENT:

½ - 13 N.C. TAP THRU - 2 HOLES REQ'D IN EACH SEGMENT.

NOTICE

REF.	CHANGE	DATE	SU

UNITED STATES RUBBER COMPANY
CENTRAL MOLD DIVISION
DETROIT - - MICHIGAN

100-20 MOLD & BUILDING DRUM

TO BE USED WITH MOLD M-2679-R

DRAWN BY	CHECKED BY	SUPERSEDES	M-2681
DATE STARTED	DATE FINISHED	SUPERSEDED BY	